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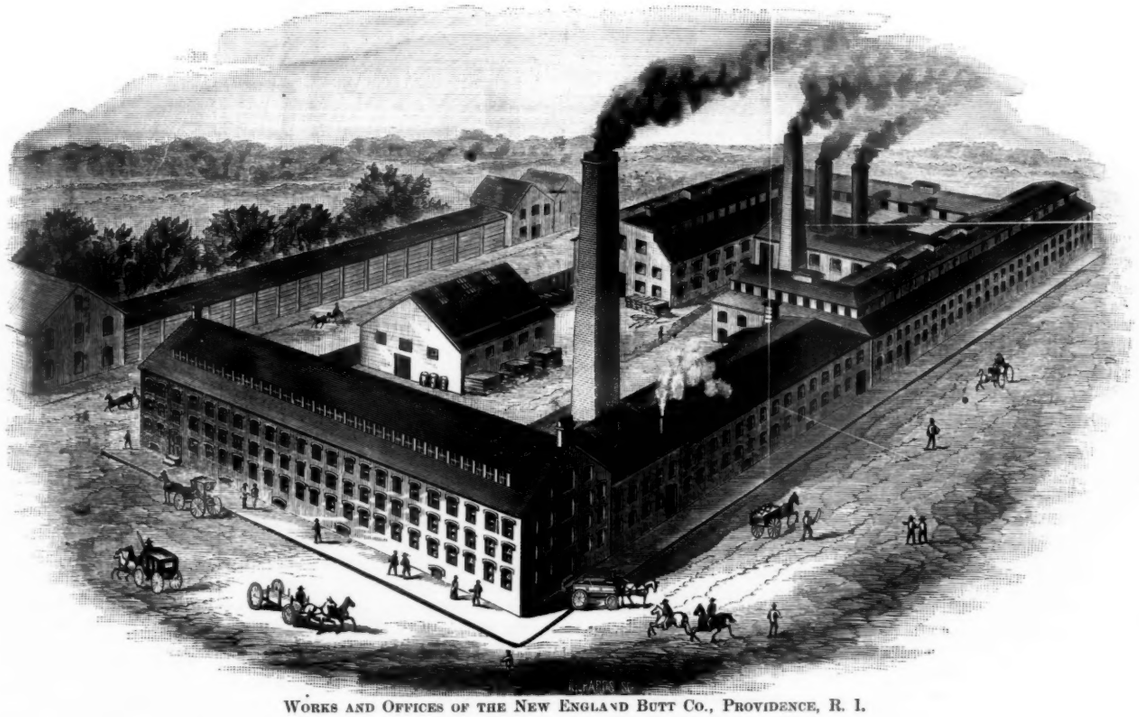
Braiding Machines for Insulating Electric Wires.—Wonderful Improvements Made in the Past Few Years.

So long as the application of electricity to the wants of man was confined to the simple purpose of signaling or telegraphing, and large bodies of water were not to be traversed, the plain naked or uncovered wire answered every purpose for transmitting these signals, but the rapid development of new uses to which electricity could be put has bent the energy of man to inventing methods of utilizing his knowledge. It was soon learned that when strong currents of electricity were to be sent over a wire, that economy and safety required that some method of insulation should be used. Inventors have for years been busy trying to meet this demand with a covering for the wire that would prove strong, flexible, durable, and as complete an insulator as possible. They have met with admirable success, and mechanical genius has kept pace with them by inventing machinery for putting into economic practice the devices thought best adapted to the purpose needed.

These insulator coverings have gone through a certain degree of evolution from a simple coat of paint or oil to the elaborate submarine cable with its complication of waterproof insulating appliances.

The most common insulation in use for telephone and electric lighting purposes are the overlaid wires, or those simply covered with a layer of silk or cotton, wound around them with a bandage, and the braid-covered wires, in which the covering, forming a true tube of braided silk or cotton, constitutes a firm envelope and one which is capable of resisting considerable friction. The overlaid or winding process is effected by means of machines called whipping wheels. The braid covering is done with a machine that is known in the language of the shop as a "waltzer," which does its work with the closeness and compactness of a true fabric or cloth. The number of threads that compose it usually varies from twelve to forty-eight. The naked wire passes from above or below, and runs between the bobbins, placed in a circular form, and as the wire moves slowly along the braiding is applied. These machines are quite complicated, and require the best mechanical skill in their manufacture.



WORKS AND OFFICES OF THE NEW ENGLAND BUTT CO., PROVIDENCE, R. I.

While on a visit to Providence, R. I., we called upon the managers of the New England Butt Company, manufacturers of braiding machinery. They supply machines for making flat, round, elastic and other forms of braid, containing from three to seventy-three strands. Mr. H. N. Fenner, of this company, furnished the following facts: The house was established in 1842 by N. A. Fenner, Esq., who was identified with it until his death in 1882, he being then president of the company. In 1853 the concern was organized under a charter, and since that time has been well known throughout the country as manufacturers of hardware specialties, and for many years as builders of braiding machines, having of late given special attention to machines for covering telegraph, telephone and electric light wire. The present officers of the company are L. Brayton, President; H. N. Fenner, Treasurer, and L. H. Eddy, Superintendent. The company's buildings have 64,000 feet of floor space, occupying 95,000 feet of land, the buildings consisting of a large foundry, with two McKenzie cupolas, capable of melting twenty-five tons of iron per day; finishing and packing rooms for hardware, a large machine shop for building braiding machines, pattern and flask buildings, and five tenement houses. The company has recently put in a new engine, made by the Hartford Engineering Company, of 125 horse power, which is driven by five large cylinder boilers. The company has also large facilities for building special machinery, and are prepared to contract for the manufacture of machines and castings.

In their catalogue of braiding machinery, they represent handsome cuts of ten different patterns of machines, all the new styles being patented. Fig 1 represents a machine for covering telephone and telegraph wire, and is called an Improved 16x24 and 24 by 24 strand double braider. They make sizes for 16, 20, 24, 32 and 48 strands. These improved double braiders are for doing heavy work in covering telephone and electric light wire. These machines braid one layer directly over another. The machine for covering electric light wire, figure 2, is also an Improved double braider for heavy work. It braids 16 and 24, and is in every respect a model braiding machine. These machines are all patented.

They make the Hercules and Soutoch Braiders, also machines for braiding whips, stripes, loops, square, solid, wire picture cords, wire bracelets, and the infinite variety of braiding known to the trade. They also furnish all kinds of braiding machine supplies, such as change worm gears, change spur gears, braiding machine tables, carriers, tension weights, bobbins, &c., &c.

Their arrangements are so complete that they cover the whole field of braiding machinery, and particularly pride themselves upon their ability to give such satisfaction to their customers that they enjoy the privilege of repeating their orders. We hope to repeat our visit to these interesting works soon, not only to enjoy the courtesy extended by the proprietors, but to study the wonderful mechanism and working of these machines.

Report on Secondary Batteries.

COST OF THE H. P. HOUR OBTAINED FROM THE ACCUMULATORS.

The cost depends, to a great extent, on the amount of daily production.

We are about to give the particulars of a continuous trial, using, on an average, 400 H. P., supposing that the maximum shall be 500 H. P. and the minimum 300 H. P. In order that the work may be continuous, we require one machine for changing, and the complete installation will comprise six machines of 100 H. P.

ESTIMATE OF THE INSTALLATION.

Six compound engines, with condensers and variable cut-off, each producing, at a pressure of 7 kilo., and

at a speed of 80 revolutions per minute, 100 effective H. P. at the fly-wheel....	180,000 francs.
6 Belleville B 6 boilers, each making 1,275 kilos. of steam per hour, with foundations, smoke stack, and erecting, including 2 feed pumps.....	110,000 "
Counter-shafting, with brakes, speed cones, belts, &c.....	60,000 "
Tools, hoisting machinery, &c.....	20,000 "
18 Siemens S D_6 Dynamos..	108,000 "
General installation-measuring and controlling apparatus.....	12,000 "
	490,000 francs.

Or 500,000 francs.

COST OF WORKING.

Work furnished by the engines: 400 H. P. × 24 hours × 365 days—3,504,000 H. P.-hour.	
Consumption of fuel: 1,100 grammes per H. P.-hour, or 3,900 tons of coal at 32 francs.....	124,800 francs.
Oil, grease, rags, waste, cloths, &c., &c., 60 frs. per day.....	21,900 "
Condensed water and feed water at the rate of 200 liters per H. P., or 1,920 cubic meters on an average per day, at the rate of 25 francs per year for a cubic meter of water daily.....	48,000 "

STAFF.

Chief engineer..	6,000 fr.	
6 engin'rs (2 posts)	21,000 "	
10 stok'rs (2 posts)	24,600 "	
Chief electrician.	8,000 "	89,200 "
2 working electricians	8,000 "	
12 workmen.....	21,600 "	
Maintenance.....		25,000 "

DEPRECIATION OF MATERIAL.

5 per cent. upon steam engines and transmission.....	12,000 fr.	38,000 "
10 per cent. upon boilers, tools, dyna's.	26,000 "	
Total.....		346,900 francs.

for 3,504,000 H. P.-hour, equivalent (at the rate of 46.5 per cent.) to 1,629,360 H. P.-hour disposable from the accumulators.

The cost of mechanical work will therefore be 21.3 centimes per H. P.-hour disposable from the accumulators.

To this cost we must add the cost of renewing the accumulators, represented, as we have previously pointed out, by a consumption of 259 grammes of material per H. P.-hour.

Taking into consideration the details of construction of the accumulators and the cost of the materials employed, we think we may adopt the figure of 600 francs per ton, as the cost of replacing the useful materials. The electrodes of the accumulators consist of lead plates cast in the form of network, of which the cells are filled with oxide of lead (minium and litharge). These plates dip into acidulated water (10 parts of water to 1 of sulphuric acid) contained in cemented wooden troughs. The actual price of lead being 32 francs per 100 kilos., and that of minium and litharge 45 francs per 100 kilos, the figure 600 francs seems justified.

The wearing away of the accumulators represents therefore an expense of 15 centimes per H. P.-hour. We should deduct from this expense the value of the old plates; but as the durability of the negative plates and of the troughs is limited, and, as it is useful to have a reserve for repairing or replacing them, we will allow that the cost of these various repairs will be covered by the value of the old plates.

Estimating the general working expenses at 250,000 francs per annum, the price of the H. P.-hour disposable from the accumulators could be put down as follows:

Mechanical work	....21.3 centimes.
Maintenance and renewal of accumulators.....	.....15.0 "
General expenses.....	.....15.4 "
Price of the H. P.-hour at the works	51.7 "

COST OF DISTRIBUTION.

The cost of distribution per H P.-hour will depend on the distance between the works and the place of consumption as well as on the mode of distribution adopted.

If the transmission is made by cable, we may compare the network of conductors with a system of water or gas pipes, and estimate the first cost of these conductors at 500,000 francs, while their maintenance and depreciation will represent an annual expenditure of 50,000 francs, or 3.1 centimes per H. P.-hour.

The price of the H. P.-hour distributed by cable would be as follows:

Price at the works.....	.....51.7 centimes.
Loss of energy in the conductors 10 per cent	5.2 "
Maintenance and depreciation of the system.....	3.1 "
Total..	.....60 "

FIG. 1.—IMPROVED DOUBLE BRAIDER. (FOR HEAVY WORK.)

FIG. 2.—IMPROVED DOUBLE BRAIDER.

If the distribution is effected by cartage, the price at the works (51.7 centimes) must be increased by the cost of carriage of the accumulators both ways, which may be estimated at 75 centimes, or 1 franc per H. P.-hour with a suitably arranged service.

COST OF INCANDESCENCE LIGHTING BY MEANS OF ACCUMULATORS.

We have made this trial with the type of Swan lamps adopted for lighting the Grand Hotel; the electromotive force varied during our observations between the extreme limits of 44 and 48 volts.

Experiments made upon four lamps at the Grand Hotel gave the following results:

1. With an electromotive force of 44 volts and a current of 0.64 ampères, the illuminating power was 1.31 carcels for an expenditure of 2.872 kilogrammeters per second.

2. With an electromotive force of 48 volts and a current of 0.75 ampères, the illuminating power was 2.02 carcels for an expenditure of 3.672 kilogrammeters per second.

The mean of the two series gives 1.665 carcels for an expenditure of 3.272 kilogrammeters per second.

Allowing for a loss of 10 per cent. through the resistance of the internal conductors, we find that the H. P.-hour furnished by the accumulators would supply 20 lamps.

The cost per hour will therefore be

Work furnished by the accumulators.....	3 centimes.
Maintenance and renewal of lamps.....	1.5 "
Total.....	4.5 centimes.

for a lamp having a luminous intensity of 1.67 carcels

The experiments of illumination at the Grand Hotel have given us some useful information concerning the rendering of accumulators. This illumination comprises nearly 700 Swan incandescence lamps. They are supplied by a battery of nine series of 21 accumulators each, charged by five gramme machines driven by a steam-engine which works from 10 o'clock A. M. until midnight.

The current furnished by the dynamos is employed from 10 o'clock A. M. until 5 45 P. M. to charge the accumulators; after this time the lamps are lighted, and absorb the entire current from the dynamos, as well as a variable quantity furnished by the accumulators.

Observations made with this installation during the day and evening of September 21st gave the following results:

The quantity of electrical energy supplied to the accumulators up to 5.45 P. M. was 37.3 H. P. hours; from 5.45 P. M. until midnight the total quantity of energy supplied directly to the lamps by the dynamos was 44.7 H. P. hours.

The total work consumed by the lamps during the evening from the 21st to the 22d September was 69.7 H. P. hours, of which 44.7 was furnished directly by the dynamos and the remainder, or 25, by the accumulators.

The rendering of the accumulators, calculated for the evening is therefore equal to

$$\frac{25}{37.3} = 67 \text{ per cent.};$$

admitting that their electrical condition, which would not differ perceptibly in reality, was the same at the end as at the beginning of the day.

THE APPLICATION OF ACCUMULATORS TO THE TRACTION OF TRAM-CARS.

Whilst awaiting the new trials, which will give more complete data upon this question, we shall point out the results obtained from the experiments on the traction of a tram-car, made, on September 26th, from Paris to Versailles.

The motive power was furnished by a battery of 109 accumulators of the 17.5 k. type, coupled in series, and arranged for using, according to requirement, 50, 70, 95, or 109 elements.

The weight of the car was	3,500 kilos.
The weight of the accumulators (the accumulator, containing 17.05 kilos of useful material, weighs 30 kilogrammes with the box and the liquid).....	3,200 "
The weight of the passengers..	1,100 "
Total weight.....	7,800 kilos.

The distance traveled from the Place de la Nation, at the depot of the Compagnie des Omnibus at Versailles, was 23,900 meters; the difference of level between the points of departure and arrival being 78.40 m.

The raising work was	611,529 kilogrammeters.
Admitting, as is generally done, that the co-efficient of friction upon the tramway is 0.01, we find that the work of traction was.....	1,864,200 "

Total useful work, 2,475,720 kilogrammeters, or 9.17 H. P. hours.

The work furnished by the accumulators during the entire journey was 4,751,813 kilogrammeters, or 17.6 H. P. hours. The journey was performed in two hours and twenty minutes, or at the rate of 10 kilometers per hour, including stoppages.

In order to complete the experiment, it was necessary to determine the work expended in returning the car to its point of departure. An unforeseen circumstance prevented the performance of this experiment.

A car being benefited in returning by the elevation acquired in going out, we may admit that the expenditure of work for the double journey would be the same as if the total course had been on a level; that is to say, in practice the total work of going and returning would be only 1.51 times the work of going, which would represent a work of 26.6 H. P. hours for the total journey of 47.8 kilometers.

The work of traction being, all other things being equal, proportional to the weight to be moved, if the car had had its complete weight of passengers, estimated at 3,500 kilos, the total weight would have been 10,200 kilos, and the work required 35 H. P. hours.

If we apply this result to the traction of an ordinary tram-car of which the average journey is 92 kilometers per day, we find that the work required per day will be 67.4 H. P. hours, which we will raise to 74 H. P. hours, to allow for the work lost by stoppages, which will be more numerous on a passenger service than on an experimental journey.

The cost price, at the works, of the H. P. hour disposable on the accumulators, being 51.7 centimes, including general expenses, the expense would be 38.25 francs per car and per day, plus the cost of lubrication and maintenance of the dynamo-electric machines or motors.

We regret that in the little time allowed to us for this experiment we were unable to render it more complete, but we hope that the occasion is not far distant when we shall be able to investigate it in all its details.—*L'Electricité.*

The Foster Electric Motor Company, of 21 Park Row, New York, was recently incorporated with a capital of $100,000.

The Syracuse Illuminating Company, of Syracuse, N. Y., was incorporated on the 24th inst., with a capital of $60,000.

The "Parker" Gas Engine.

This engine has, after being thoroughly tested, been in successful operation for some months, and is attracting considerable attention. The chief aim of the inventor has been to secure greater efficiency from the expansibility of the exploded charges upon the piston than has been secured heretofore. The explosion of a mixture of gas and air occurs in about the twenty-seventh part of a second, and taking place in the cylinder of any ordinary gas engine, acts very similarly or equivalent to a blow. As during the period of combustion the pressure is at its maximum when the crank is near the dead center, the loss of energy is very apparent. In the Parker engine an entirely new principle is utilized. The charge is exploded in detail, or by a series of explosions during the power-stroke, producing a succession of impulses while the piston is traveling, and thereby securing a greater pressure after the piston has reached a longer leverage on the crank. The method by which this result is secured is by depositing the charge in compartments, or auxiliary chambers, directly connected by ports with the bore of the cylinder, and controlled by the piston in its travel. The auxiliary chambers, as shown in Fig. 1, section of cylinder, sufficiently illustrate the operation. The charge is forced into the chambers and the ports to them covered by the piston, and held in reserve until the piston uncovers them in the power stroke, when the flame from the initial charge ignites the charge in the first compartment, the resulting explosion firing the next; the action being a rapid series of impulses of elastic pressure, instead of a terrific shock, which is the case when the charge is all exploded at one ignition.

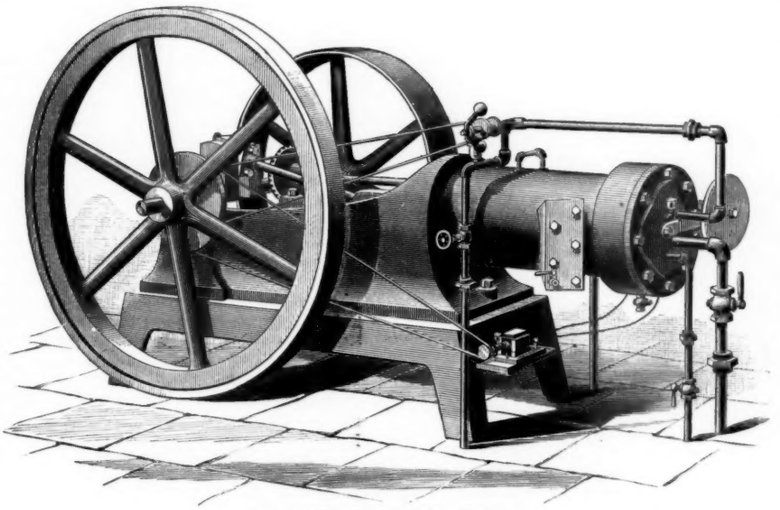


Fig. 1.—The Parker Gas Engine.

Another very material advantage secured in this engine is the admission valve, which is simply a flat piece of metal located inside the cylinder head, and moved to admit the charge and close the ports by an intermittent cam movement. At the time the valve moves there is no pressure in the cylinder, the force or pressure in the cylinder holding the valve firmly to its seat when stationary; consequently the friction is reduced to a minimum, which insures naturally a very long life for the valve. As the valve requires but little oil, there is no trouble about the air and gas ports becoming clogged with the product of burned oil, which is often very annoying and troublesome.*

The jet or slide form of igniting, with its complications and difficulties, is entirely obviated by the dynamo spark. This method seems to be most certainly in the right direction. The small dynamo by which the current is produced, is operated by a ¼-inch round belt, from the crank shaft. The flash is easily obtained by simply breaking the current inside the cylinder. A very weak charge can be used in the cylinder, for the reason that the flash is made in the midst of the mixture. There is no danger of being blown out, and it is reliable and certain to ignite every time it is desired. The power to operate the dynamo is insignificant, as the slack ¼-inch round belt is amply sufficient, with a speed of the dynamo of 500 to 600 per minute. It is claimed that the saving over the jet method is fully from 8 to 10 cubic feet of gas per hour; besides the air of the building is not impregnated with escaping gas from jets with slide igniters.

The durability of dynamos is well known. There is practically no diminution to their efficiency from years of using. The flash is produced inside, by simply breaking the current at the proper time. The break or igniter is made of *phosphor-bronze*, which gives it great durability. These engines have run for months without failing to explode every charge that was combustible. The certainty of ignition is assured, as the flash occurs directly in the combustible mixture of the initial charge. The saving of 100 feet a day by this method of ignition amounts to about seventy-five dollars per year. The starting of this engine is rendered a pleasure rather than a laborious task, as is so frequently the case with jet ignition. A four-horse power indicated engine has operated for several months thirty Maxim incandescent lamps up to standard power.

The engine is regulated by an automatic governor, arranged to control the gas supply. The governor is adjustable, so that it regulates the engine at different speeds, from 120 to 250, or any desired speed; a very advantageous feature. The gas consumed is in direct proportion to the power developed.

When there is but a small amount of labor or load on the engine, a correspondingly small amount of gas is used. The engine gives out for actual labor very nearly all the indicated horse-power, for the reason that the steady drag of friction is dispensed with; the revolutions are very steady and smooth.

The future before gas engines is certainly very encouraging, as the difficulties of steam power are in a great measure dispensed with.

No danger can result from boiler explosion; no licensed engineer is required; the engine can be placed in any part of the building, started and stopped in an instant; when not running is of no expense, and can be operated by any one. The gas consumed is about 20 feet per indicated horse-power per hour, of good gas. The higher the illuminating qualities of a gas the less is required to give a certain amount of power.

The engine is easily started, by simply turning on the gas and giving the fly-wheel two or three revolutions by hand. For driving dynamo-electric machines, printing presses, lathes, elevators (freight or passenger), exhausters or fans; in fact, where any power is required that is usually furnished by a steam engine, the gas engine will be found far superior.

The engine is the invention of Mr. L. C. Parker, of Robinson, Kan., and is now being built by the Yonkers Manufacturing Company,; Mr. Charles E. Skinner, general agent for the company. The engine is built in sizes, from one to twenty-horse power, inclusive.

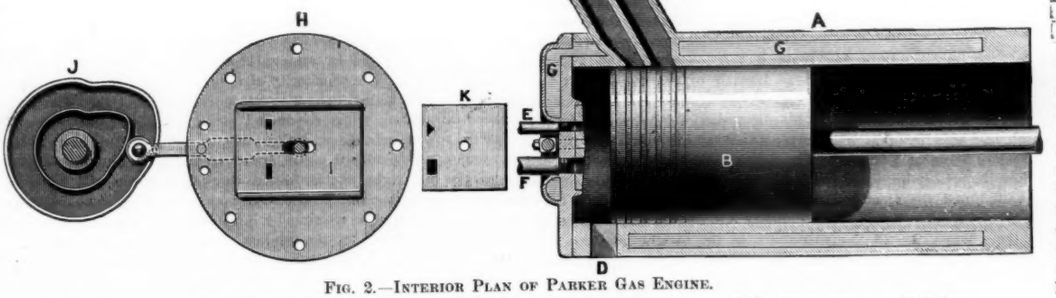


Fig. 2.—Interior Plan of Parker Gas Engine.

A, Cylinder. B, Piston. C, C, Auxiliary chamber. D, Exhaust port. E, Gas port. F, Air port. G, Water space. H, Cylinder head. I, Valve and seat. J, Cam wheel. K, Valve.

* This engine has run constantly for *months* without clogging up a particle.

Electric Arc Wires.

The following letter from General Manager Rowley, recently appeared in the *Times*:

Believing that you wish to treat fairly and impartially the subject of electric arc wires and that the total amount of property destroyed, so far as the Fire Marshal's books show, does not exceed $85 since that time, and this, too, with nearly 2,000 arc lights in use, one-half of which are inside various places of business. This great immunity from fire is owing, first, to the natural safety of the system, and secondly, from the fact that the regulations established by the New York Board of Fire Underwriters are rigidly enforced and carried out in every instance, and that no arc light is allowed to be used until the same has been inspected by the board and pronounced to be in accordance with their regulations. We think this record should be a complete answer to all the assertions made as to the danger from fire by the use of arc lights. As to the danger to life, when it is considered that since the introduction of arc lighting, now over three years, there never has been a case of an injury to a citizen of New York, and that but one person, an employe, through his own carelessness, in disobedience of instructions, lost his life, and with some 200 or 300 employes in both companies who are constantly handling the wires, should be conclusive evidence of the safety of the systems. It can be said justly in favor of the light that it has been the means of suppressing crime, and, no doubt, were its introduction extended to the water fronts of this city, the dangerous character of those localities would be greatly improved, and, finally, the whole subject is one that not only property owners but every citizen of New York should be more interested in extending its introduction rather than throwing obstacles in its way. Much more could be said on this subject in the defense of our systems, but we fear to trespass too much on your valuable space.

C. M. Rowley,
Vice-President and General Manager.
Brush Electric Illuminating Company, New York.

The First Law of Electrostatics.

At the Physical Society, London, on December 8, Professor Sylvanus P. Thompson read a paper on this subject, in which he showed that if electricity be considered as a self-repulsive medium, a surplus in one place and a deficit in another would give rise to motion between them, *i.e.*, attraction. This inference, as well as many other electric phenomena, such as induction, the distribution of charge in the Leyden jar, and the flow of current in a battery, were illustrated on the same hypothesis by means of self-repelling magnetic poles buoyed with cork and floated on oil.

The repelling poles tend to a uniform distribution of themselves throughout the surface of the oil, which would correspond to "space" in nature. A surplus of poles at one place led to movement until the distribution was uniform, and the collection of the poles on confining barriers placed across the surface of the oil correctly illustrated the behavior of electric charges referred to above. Professor Thompson pursued the hypothesis to the inference that electricity is either ether or ether electrified; the former supposition being the more probable.

Experience has shown that the dividing line between electricity and gas is as strongly marked as that between gas and kerosene oil.

General National Exhibition at Budapest, 1885.

FOR MOTORS, WORKING MACHINES AND TOOLS FOR ARTISANS; AS WELL AS FOR AGRICULTURAL MACHINES OF THE LATEST AND MOST IMPROVED CONSTRUCTIONS, AND ALSO FOR IMPORTANT PATENTED INVENTIONS AND IMPROVEMENTS.

In conformity with a bill submitted to the Hungarian Legislature by Count Paul Széchényi, Royal Hungarian Minister of Agriculture, Commerce and Industry, the Bill has been passed for the purpose of instituting a General National Exhibition to be held at Budapest, and has received the sanction of His Majesty the Emperor Franz Joseph.

By this Act the General National Exhibition to be held in the year 1885 at Budapest has not only been placed under the patronage of the Hungarian Government, but has been declared a national question—the Government being invested with the direction of the undertaking to propose and organize the same.

A General Commission has been appointed by the above-named Minister, and intrusted with the immediate management of the affairs of the exhibition.

The General Commission is composed of the following members: President, Dr. Alexander Matlekovits, Secretary of State; Second President, Count Eugen Zichy, President of the National Industrial Society; Director, Dr. Julius Schnierer, Counselor of the Ministry.

It has been decided and decreed by the General Commi sion, in consideration of the limited character of the exhibition—it being intended to produce as complete and faithful a picture as possible of the productions and handiworks of Hungary—to organize simultaneously with the General National Exhibition, and in the same precincts, a separate international exhibition of motors and working machines, tools and implements for artisans and traders, as well as agricultural machines of the latest and most improved constructions, and all important patented inventions and improvements.

It has accordingly been taken into consideration to propose the participation of foreign countries in this special exhibition, and to make arrangements for the exhibition of their superior productions.

The General Commission, in coming to this decision, has been chiefly guided by the consideration of the importance which must be ascribed to the exhibiting of machines and tools, as well as the latest inventions in the construction of agricultural implements, as prime factors in the sphere of industry and agriculture.

In consequence of the magnitude and rapidity of progress in the sphere of technics and communication, a change has taken place in the industrial productions of Hungary, similar to that which has been wrought in the Northern and Western States of Europe. For the last decennium the greatly-improved means of communication, and the great increase of international intercourse, have exposed Hungary to the competition of the more advanced foreign industry; on the other hand, a very important tendency has appeared for raising industrial establishments on a very large scale, by the more intensive application of the powers of nature, and a more extensive employment of the principle of division of labor, which tendency is thrusting the smaller artisans rapidly into the background. With regard to the wholesale production of cheap manufactured goods, not only is it a pressing necessity, but perhaps the most important problem of the political economy of our times, to find ways and means of saving the smaller industries from certain extinction, to preserve and advance the material welfare of craftsmen, by enabling them to fill up the place in the circle of industrial productions, which the large manufacturing establishments, wanting in individual character, and bent on only wholesale production, are unable to occupy.

In order to solve this highly important question of political economy, it is essentially requisite to put into the hands of intelligent and assiduous craftsmen such motors or perfected working machines and tools as are at the disposition of the wholesale producer, or that the methods and implements used by the wholesale producer may be so modified as to be used by handicraftsmen, and put into motion as easily and cheaply as by the wholesale manufacturer. Should this succeed, then the regeneration of the humbler trades is to be hoped for, and that they may be able to exist even side by side with the powerful wholesale manufacturer, since innumerable and important branches of industrial production exist, which can only be cultivated by individual hand power, and must always remain in the hands of mechanics.

These general points are the main cause which have induced the General Commission to organize a special exhibition of machines and tools for mechanics in the precincts of the General National Exhibition at Budapest. It is the intention of the General Commission to bring before the public all such machines in motion, in order that the public may judge for themselves, and be convinced of their advantage.

Hungary, notwithstanding her industrial advancement, still remains an agricultural country. Consequently, the production of agricultural machines forms the most important branch of her machine industry. Now, there is no doubt this branch of industry has lately made very satisfactory and noteworthy strides, and the exhibition will, consequently, give a complete picture of the result. Notwithstanding it is not only in accordance with the general object of the exhibition, but it is also desirable that an opportunity should be offered to foreign manufacturers to bring such agricultural machines of their own making to the exhibition, which can show some important ameliorations or innovations. By admitting such machines to the exhibition, the Commission thinks to render an important service, not only to the country itself, but also to the manufacturer concerned, as well as to industry in general.

As the representation of the progress made in industrial undertakings is the main object of exhibitions, the progressive inventions and improvements have naturally taken a leading position in all great exhibitions—at least so far as their importance, adaptability and usefulness are verified and protected by being patented in some one country. In exhibitions a mechanic is principally enabled to have an insight, not only into what has already been attained, but also into what has been attempted; the capitalist is enabled in exhibition to look for the best possible means of investing his capital in some useful and profitable industrial concern; and, finally, the inventor or patentee himself will be enabled to avail himself of the opportunity for the propagation of science and the appreciation of his invention in the widest circles of society, which the exhibition offers.

The General Commission are justified in considering as well-founded and deserving of support, the bringing of these three branches of industry into one especial section of the exhibition, by the insight into the progress and development which their union will simplify.

It is perfectly natural that this special section of the exhibition must be of an international character, since the industrial productions of Hungary proper are only the commencement of the creating power mentioned above, and consequently the objects to be exhibited are mostly, if not exclusively, to be expected from foreign countries, which are in a more progressive state.

The General Commission have the hope that the foreign exhibitors of engines, tools and agricultural implements, as well as the possessors of foreign patents, will embrace the opportunity offered them, the more so as every possible facility will be given them to profit by not only the general advantages which the exhibition may offer, but also by the prospect of having opened up to them a market not only in Budapest and Hungary, but farther abroad, which will bring them into closer connection with the neighboring countries on her eastern and southern frontiers, and give them the opportunity of carrying on large business transactions.

With regard to the important question of the international section of the exhibition above alluded to, the General Commission have intrusted a Special Committee with the management of the affairs of this section.

This Special Committee will consider it their duty to secure the success of the special exhibition in every possible manner, and to facilitate to the utmost the representation of exhibitors at the exhibition.

The printed rules, regulations, communications, &c., &c., of the Special Committee will, on demand, be forwarded; and may also be obtained from agencies appointed in the more important cities, as well as at all the Austro-Hungarian Consulates.

MATLEKOWITS, President.
COUNT EUGEN ZICHY, Second President.

The members of the above-named Special Committee are to be as follows:

President: Count Eugen Zichy, Second President of General Commission. Vice-President: Dr. Nikolaus v. Szvetenay, Royal Counsellor, Member of G. C. Secretary: Johannes Jónás, Draftsman of the Chamber of Commerce; Edmund Miklós, Director of the Budapest Elevators. Members: Emil Asbóth, Professor of the Royal Joseph Polytechnic in Budapest; Karl Hegedus, Director of the National School of Industry; Dr. Karl Herich, Counsellor of Section in the Ministry of Agriculture, Commerce and Industry; Ladislaus Láng, Machine Manufacturer, Budapest; Desider Nagy, Professor of the R. Joseph Polytechnic in Budapest; August Pilch, Professor of the R. Joseph Polytechnic in Budapest; Béla Schlick, Director of the Schlick Iron Foundry, Budapest; Adolf Túroczy, Director of the Customhouse in Budapest; Stefan Verderber, Sub-director of the Royal State Railway; F. H. Ziffer, Director of the Hungarian Spinning Company; Karl Zipernovsky, Director of the Ganz Electrotechnic Manufactory, Budapest.

The address of the office of the Special Committee: BUDAPEST, HUNGARY, IV., Maria Valeria u. 12, II. em.

New Method of Electric Lighting.

The Gaulard-Gibbs method of electric lighting, of which an illustration may now be seen over a section of the Metropolitan Railway, is the latest development in the utilization of electricity as an illuminant. The chief characteristic of the new system consists in the use of secondary generators. The company are now illuminating the stations at Notting Hill Gate, Edgeware Road, Gower St, King's Cross and Aldgate. For this purpose the electricity is developed at Edgeware Road by an engine of thirty horse-power. The peculiarity of the system is that the main current generated at the central station, when conducted along the wire to the subsidiary stations, is not, as is almost universally the case, transferred directly into light, but is passed through a secondary generator in which the potential is varied as may be required for incandescent or arc lamps, or for the production of mechanical power. The primary circuit, which consists of a cable of four millimeters, or about one-sixth of an inch in diameter, is fifteen miles long, and is metallically closed with the generating dynamo. It is worth mentioning as a notable fact in connection with this system, that whatever may be the electro-motive force traversing the circuit the cable may be touched at any point throughout its whole length without danger. The chief difficulty hitherto experienced in the transmission of electric energy has been that of supplying a current which, whether utilized for lighting purposes or for driving machinery, should be of a potential variable according to the different requirements of consumers. Messrs. Gaulard & Gibbs' ingenious system for generating and applying the electric current has obviated that difficulty, and will enable consumers to manipulate electrical energy much in the same way as they do now gas and water, and to turn it into currents suitable for high or low-resistance lamps, for working machinery, for electro-chemical processes, and for various domestic appliances. Hitherto, great difficulty has been found in the lighting of incandescent lamps at any distance beyond 500 yards from the dynamo machine. Even a distance of 500 yards can only be accomplished by using conductors of large sectional area, or otherwise a very considerable part of the power of the engine would be used in heating the leads.

The lighting of the stations referred to already between Notting Hill Gate and Aldgate (inclusive) is effected by a force of thirty-horse power, which is transformed by means of a Siemens alternating dynamo machine into a current of 2,000 volts and 10 ampères. A remarkable feature in the transmission and distribution of electrical energy by this system is that the loss in overcoming resistance remains constant in a line of given length, whatever the power transmitted may be. Thus, if required, an engine of 1,000 horse power might be substituted for the engine now in use, without any variance in the loss occasioned by overcoming the resistance of the conductor, provided the uniform value of the current remains fixed, as it would do. Taking the example given by M. Gaulard, the loss of energy in transference on a circuit of fifty miles, formed by a cable of four millimetres (8 B. W. G.) in diameter, would be $10^2 \times 50 = 5{,}000$ ampère-volts, equivalent to about 500 kilogrammetres, or 6⅔ horse power, no matter whether the force transported and distributed be one of 20 or 1,000 horse power. It is not too much to say that Messrs. Gaulard & Gibbs have invented and perfected the only system which affords facile means for at once converting natural forces into electrical energy, and conveying and distributing them over great distances at a practically unlimited number of points. In conducting their experiments for arriving at new and improved methods for the application of electricity to various industrial and scientific pursuits, Messrs. Gaulard & Gibbs had the courage and the wisdom to leave the beaten track marked out by Faraday, which electricians in recent years have trodden over and over again, and to go back to the comparatively neglected researches of Ampère. Faraday's experiments had been pursued in reference to the action of magnets or of magnetized iron on bobbins of insulated copper wires, while those of Ampère had as a basis the influence exerted by currents in movement upon bobbins of insulated copper wire. It is needless to point out that Messrs. Gaulard & Gibbs' system for the utilization of electricity has been built upon the lines indicated by the experiments of Ampère, and that there is, therefore, a radical and material difference between it and other systems, which spring more or less from the results achieved by Faraday in his researches in the domain of electrical science.

As the secondary generator is destined to play henceforth a most important and indispensable part in the transmission and distribution of electrical energy in its various forms, the following brief description of it may prove interesting: A cable consisting of a central wire, having a sectional area of four millimetres, with six smaller cables wound round it, is rolled in parallel spirals upon a hollow cylinder. Each of the smaller cables is formed of eight insulated copper wires of one millimetre sectional area. Several of these cylinders are fixed on the same stand, and are so united as to allow the alternating current of the thick central wire to generate, by the influence of its movement, a current of different potentials on the fine copper wires. Thus the main current, which is alternating is made at the different stations or points where light or power is required to traverse the primary conductor, that is the thick central wire, which by the reversals of polarity and the alternation of the primary currents, generates in the copper wires secondary currents of a potential suited for any purpose to which they may be applied. By means of a small handle or regulator, the consumer can, at his will, limit the number of cylinders through which the electric current passes to one or more, thus determining according to his requirements

the production of electric energy. Another handle regulates the introduction into the cylinders of soft iron bars, by means of which the current may be increased or diminished, and a perfect regulation of the light ensured. The soft, steady light obtained from this new system is due to the fact that the electric current traversing the fine copper wires of the secondary generator depends only on the quantity of the primary current, and is not influenced by its electromotive force. It is characteristic of Messrs. Gaulard & Gibbs' secondary generators that they produce currents suitable to every kind of lamp, whereas in other systems each lamp requires a special current and a special dynamo machine.

It is obvious that the employment of one principal wire of small dimensions for conveying the primary current throughout the whole circuit, however long, will effect a great saving. Indeed, it is evident that an important economy will be brought about in the leads alone from the secondary generators to the lamps, which would always be close together—so important, indeed, that it would probably be represented by something like one-fifth of the outlay rendered necessary by the most economical of other existing systems, including the cost of the secondary generators. We speak of economy within the extreme limits possible by any other system; but beyond a certain distance there is no other system that can compete under any conditions whatever with Messrs. Gaulard & Gibbs. Furthermore, it seems now demonstrated beyond a doubt that, except for small local isolated installations, electrical energy will in future only be employed in the form of what Messrs. Gaulard & Gibbs have termed secondary generators; that is to say, that the primary current from a dynamo machine will no longer be used for lighting lamps directly, but circulating on a metallically closed circuit, will be made the means of generating at any number of points in that circuit currents of any potential suitable for all domestic and mechanical purposes, and for various electro-chemical processes. The first application of the Gaulard-Gibbs system being for the production of light, it may be imagined that this is the direction of its development; but it must not be forgotten that however important the distribution of light may be, that of power has a much wider and indeed almost indefinite field of development. The anticipations already shadowed forth as possible by scientific minds have now been brought within the sphere of practical application; and we have no difficulty in saying that the important step taken by Messrs. Gaulard & Gibbs will mark an epoch in the history of electrical science, and exert a greater influence on the daily life of human beings than anything that has appeared since steam became a factor in our civilization. What is very unusual nowadays, we understand that the enterprise on which Messrs. Gaulard & Gibbs are embarked is one of a very exceptional character, seeing that no promoters, intermediaries, or principal agencies are mixed up with it. The system of secondary generators has been perfected by the unassisted labors and outlay of these two gentlemen, and we are informed that the capital of the company has been privately subscribed among friends.

The National Company for the Distribution of Electricity by Secondary Generators (Limited) have drawn up a project for the lighting of the Suez Canal throughout its whole course, and have presented it to M. De Lesseps, who appears to regard the project with much favor. It is not generally known in this country that ships in passing through the Canal have to remain stationary during the night. If the Canal were lighted so that the shipping could pass through it at night as well as during the day, nearly half of the time at present occupied in getting from the Mediterranean to the Red Sea, and *vice versa*, would be saved. It is proposed to light the Canal by means of 1,380 lamps placed on its banks, and on fixed beacons in the passage through the lakes. The primary current of 40,000 volts and 16 ampères required for supplying all these lamps would be generated by four dynamo-machines of the capacity of 10,000 volts, and worked by a total horse power of 850. The primary would be transmitted on a cable 350 kilometers in length, formed by 18 wires (No. 9 B. W. G.) the resistance of which would occasion a loss of about 60 horse power. The total cost of the installation would be £81,750, and the expense of maintenance would be about $10,000 per annum. This would be a comparatively small outlay, which would enormously benefit commerce, and doubtless handsomely pay the Suez Canal Company.—*Ex.*

KINGSTON, JAMAICA, Dec 4, 1883.

In my last I gave an outline, as far as Kingston is concerned, with a little of the politics of the time. As it might be far more interesting to the readers of your paper to know what and where Jamaica is, I purpose giving a brief account of the island.

Jamaica is bounded on the north and east by that part of the Carribbean Sea which separates the Islands of Cuba and St. Domingo. Its greatest width is 49 miles and least about 22 miles; the extreme length is 144 miles. It contains a population of 580,804 souls. The products of the country are sugar, rum, cinchona, arrow-root, coffee, tobacco, ginger, pimento, dye-woods, cocoa and fruits, the two first-named being the chief. Tobacco and cinchona are of late years, the former being extensively cultivated by the Cubans, who at the time of their revolution found a home in this country, and it now ranks almost equal to that grown in Cuba. Cinchona was first introduced in the year 1860, but not till 1868 was it permanently established by the Government, and now promises to become one of the chief articles of export. The value of that exported in 1882 realized $12,695.

The fruit trade is very extensive between this place and America. In 1873 the value of that shipped was $23,000, and in 1881, $218,225, whilst that of 1882 fetched the handsome sum of $618,165. Nearly all this trade is carried on between a place called Port Antonio—a small seaport—and the U.S.

The total value of exports from this island in 1882 was $8,825,285, whilst the imports for the same year came to $6,610,000.

The climate is regarded as favorable to persons who suffer from bronchial and tubercular diseases, whilst those who suffer from gout, rheumatism, and other kindred affections will find it a good place of resort, there being mineral springs situated in different parts of the island, which offer great advantages to them. The Jamaica Spa has been likened in quality to that of the chalybeates, of Spa, in Belgium.

There are two baths. The Milk River Bath is 53 miles from Kingston; 28 can be gone over by rail, and the other 25 by vehicular conveyance. The Bath of St. Thomas-the-Apostle is 31 miles from Kingston. They are both managed by a board of directors. At the former place there is accommodation for visitors, with the exception of boarding, for the nominal sum of 37 cents per diem. This charge is merely for maintaining the buildings and keeping the baths in good order. At the other you would be required to take up lodgings contiguous to the baths, as there is no accommodation of that sort.

There is now in course of construction lines of railroad in extension of the existing roads under Government control, which, when finished, are calculated to develop the resources of the country to a much greater extent than hitherto.

It has been said Jamaica will be materially benefited by the Panama Canal when accomplished. An article upon the subject has been published by a competent authority, who writes: "A glance at a chart of the North Atlantic Ocean will at once show what a commanding position this island holds on the ocean highway from America and Europe to the Pacific *via* the Panama Canal. All vessels from ports in the United States on the Atlantic seaboard necessarily pass within sight of it.

"The course from British ports, and those of all Northern Europe, lies but a short distance south of it, and even those ships which sail from Southern Europe and the Mediterranean, if bound for the canal, would have to go but little out of their way to call at Jamaica, while the greater facilities for shipping, which Jamaica could supply, would more than make up for the slight digression, for the islands lying more directly in their route are so unfortunate as not to possess a single harbor sufficiently safe and commodious as to fit it for a port of call."

A dock would seem the most desirable thing; it has been long talked of, and it is to be hoped that a movement of this kind will soon be taken up and carried through, as it is sadly required.

Telegraphic communications exist throughout the island, maintained by Government funds. What might be considered as an addition, would be a good telephone system.

A very interesting feature in the history of the colony was the assembling of the other West Indian bishops, who arrived here on the 4th ult., for the purpose of forming a Provincial Synod. Dr. Austin, who has been over forty years the Bishop of British Guiana, was chosen Primate. They again left on the 25th for their respective dioceses, highly well pleased with all they saw.

Bishop Holly, of Hayti, was prevented from coming in consequence of the unsettled state of that country.

H. I. H. Prince Heinrich of Prussia, and grandson of the Emperor of Germany and Victoria, paid a visit last week.

The new Governor for Jamaica is expected to arrive this month with full instructions respecting the government.

C. A. DE S.

The Philadelphia Electrical Exhibition.

Preparations for the great electrical exhibition to be held in Philadelphia next fall have so far progressed that rules and regulations have been prepared for the government of the extra classification of the various apparatus. The different groups will consist of: 1, apparatus for the production of electricity; 2, electric conductors; 3, measurements; 4, applications of electricity, under which there are two subdivisions, apparatus of small power and that of large power; 5, terrestrial physics; 6, historical apparatus, and 7, educational and biographical. The section devoted to measurements is probably one of the most interesting to scientists and the least known to the public of any of the exhibits. It is the purpose of the committee to make a notable departure from usual exhibition ideas, in not giving any medals or diplomas. The reports of the judges of each department will be given after the fashion of a jury, and will be a statement of the facts in regard to the size, speed, force, energy, resistance and any other points of the exhibit which may call for mention; but these will not be given by any guesswork. Instruments of precise measurement will be used by the committee of judges, and the conclusions reached will be the record of the judges. By a special arrangement with the Treasury officers, such instruments of precision as are not to be had in this country will be admitted without duty, on the bond of the institute being given that they will be kept for the single use of the institute at the exhibition. If arrangements can be made by the committee for an unbroken water front on the Schuylkill, the method of placing an electric light of 100,000 candle-power in the bed of the river, to discover torpedoes or other implements of warfare, will be exhibited by the Ordnance Department of the United States Navy.

The Merchants' Electric Light and Power Company, of Boston, will have ten 100-horse power boilers for their new station on Congress street. These will be set with the Jarvis furnace, to use screenings for fuel. They will also use twenty Armington & Sims Company engines, each to run separate circuits and be able to furnish one thousand arc lights.

A new Electric Railway has just been invented by F. H. Danchell, London.

Electric Lighting and Car Propulsion.

The Paris correspondent of the London *Telegraph* says that when the Continental Hotel there was recently lighted up for the first time under the Faure system, the stored electrical energy was brought to one of the doors of the hotel in a cart. Communication with the candelabra in the largest room of the first floor was established in a few moments, in the presence of some 300 visitors. Many of those present afterward journeyed to the Arc de Triomphe and back in a tram car propelled by electricity supplied in the self-same accumulators, by way of testing the availability of the power thus stored.

A Simple Insulating Stand.

Professor Sylvanus P. Thompson has designed a simple bottle insulating stand after the plan of M. Mascart, but costing only a few pence, whereas Mascart's costs about a guinea. The stand is made by blowing one end of a glass tube into a kind of a flat foot, by which the tube stands up from the bottom of a glass bottle. A little paraffine wax is used to cement the tube properly to the bottom of the bottle, and paraffine oil can be employed as an insulating fluid in the bottle, as well as strong sulphuric acid, which is used by Sir W. Thomson, and M. Mascart. Dust is kept out of the bottle by a small guttapercha or rubber parachute, which slips up and down the glass tube by hand. The open end of the tube above is useful for holding charged conductors.—*Engineering.*

Electric Light Motor.

The Pacific Mills, Lawrence, Mass., have decided to introduce incandescent electric lighting. The New England Weston Company have the contract, and are laying the wires for a six-hundred-lamp incandescent plant.

Akron, O., has a new enterprise—the manufacture of a newly-patented electric headlight for locomotives. The invention lies in a perfect double pendulum and counterpoise, which renders it impossible for the carbons to touch for more than an instant, and this is attached to the clock-work. The feeding of the upper carbon is controlled by the counterpoise. When the carbon is so low down as to form a continuous circuit, a magnet raises the counterpoise. This stops the feeding of the carbon, which burns enough to weaken the current. Then the counterpoise drops back, starting the feeding again. The double pendulum renders it impossible for the light to go out.

The Weston electric light in Davenport gives unexpected satisfaction, even to Mr. Frank Badt, the electrician who superintended the putting in of the plant. The lights produced on the testing circuit were considered so perfect that that circuit was disestablished, and the lamps put in their permanent positions in the business places of the subscribers to the light. The current was turned on Wednesday evening last, and Davenporters generally were delighted with the illumination. There is not a flicker observable except during the first minute or two after the current has been turned on. As soon as the action of the electricity has pointed the fresh carbons, the light is perfectly steady. If the Moline plant works as well, and there is no reason why it should not, it will be a matter for congratulation.—*Rock Island News.*

The Brush Electric Light Company assert that their new commutator is by all odds the most important invention in electric lighting for a long time. They are busy making changes on their dynamos; and if their claims hold good, they have reduced the expense of lighting materially.

In reply to an inquiry as to the cost of a dynamo for twenty to thirty-one lights, we would say that the last estimate we had on that size was $2,500 for a twenty-light dynamo, and $3,000 for a thirty-light machine, the arc lamps costing about $65 each.

Telephonic News

Presentation to Major Downs.

Mr. L. N. Downs, the popular general manager of the New England telephone and Telegraph Company, was agreeably surprised on his return from Texas, the day before Christmas, to find an elegant roll-top desk, arm-chair, and letter-file (all of cherry wood) in his office, the gift of the old superintendents, before the consolidation. It is a very handsome present, and the recipient is worthy of the esteem in which he is held by his subordinates and the public in general.

Presentation at Frederick, Md.

Christmas eve, the employes of the Frederick Division Chesapeake and Potomac Telephone, presented Superintendent E. L. Miller with a handsome silver service. The presentation was made by W. S. Taylor, Esq., in a neat little speech. He said, in conclusion, "We make you this present as a token of appreciation of the many little kindnesses we have all received from you in the past, and we hope you will receive it both as a memento of our esteem for you and a pledge of our willingness to serve you in the promotion of the interests of the Chesapeake and Potomac Telephone Company. At the same time, Superintendent Miller was presented with a handsome Aiken gold pen and holder, also case, by Mr. C. D. Landerkin, manager of Westminster exchange. Mr. Miller entertained his employes at his residence, Thursday, 27th ultimo.

Telephone Stock Suit.

The Mexican Telephone Company is suing Frederick M. Delano, John D. Haines, and George N. Blanchard in the Superior Court upon a claim that, on May 2d last, the company owned 9,999 shares of the capital stock of the Mexican Peninsular Telegraph and Telephone Company, of the par value of $10 per share. Haines at that time was secretary and Delano treasurer of the plaintiff company. The allegation is that Haines transferred five thousand shares of the stock of the Mexican Peninsular held by plaintiff company to Blanchard without the authority of the company, and without any consideration. It is also claimed that this transfer was in accordance with an agreement between Haines and Delano, who seek to hold the stock for their own use. A motion was made to restrain the transfer of the stock during the pendency of the action, upon the ground that the defendants have no right to it, and also that they are not responsible. The motion was granted, on Monday last, by Judge Truax.

Mexican Telephone Interests.

CITY OF MEXICO.—A concession for an opposition telephone company in the federal district has been granted to Juan Gutierrez, a friend of Messrs. Delano and Haines. As it would be hopeless to institute another exchange, it is believed that this movement, and that of the Mexican Central Telephone Company, are simply intended to make trouble for the Mexican Telephone Company. The latter holds until April 12 the rights reported as acquired from the former military districts.

Directing 300 Men a Mile Away.

It is told of a gentleman at Rochester, N. Y., that while lying in bed with a broken leg, he had directed the work of 300 men a mile away, by means of the telephone.

Mexican telephone is dull at 2½. The Mexican *Financier* says the rapid growth of the telephone in popularity throughout the republic is particularly gratifying as a proof of the progressive spirit of the Mexican people. In all the business communities of the country the telephone is in increasing demand, and highly favorable reports are received from the companies operating in the various sections. Here in the capital, the parent company, now thoroughly relieved from the difficulties which formerly embarrassed it, has entered upon a highly prosperous career. Subscriptions are coming in at an average rate of two a day, and it is hard to keep up with orders at present. The exchange established in the pleasant suburban city of Tacubaya, connecting with the central office here, begins under most favorable conditions with a good number of subscribers, which will give the telephone popularity with the best classes. Other profitable suburban connections are contemplated. The connection which will shortly be made with Toluca will be a new feature in telephonic business here, introducing the long-distance connections so popular now in many thickly-populated parts of the United States. The communication by telephone will be cheaper and more convenient than by telegraph, for the tariff between here and Toluca will be 25 cents for a communication, being message and answer, or five minutes of uninterrupted conversation. Like communication will soon be established with Puebla over a line to be built jointly by the Mexican and Puebla companies.

Telephonic Facilities.

The telephone is a modern marvel. Within distances of a hundred miles or so it renders vocal intercourse possible, and thus affords facilities for the spread of information as to all matters, particularly those connected with business. As originally introduced in this city the system was somewhat defective; the defects were, however, remedied as rapidly as possible, and more especially since the enterprise passed into the hands of the Great Southern Telephone and Telegraph Company. This company has indeed worked wonders in the way of adjusting means to ends, and been lavish in its expenditures for the improvement of telephonic methods, as the results of its efforts at Evansville, Ind., and Nashville and Memphis, Tenn., abundantly testify.

The telephonic business is in all respects legitimate, and as such commends itself to public favor. To large trading communities it has become a necessity, and to tax it heavily is to place an impost on information.

It is in the interest of the Telephone Company to enlarge its circle of subscribers in every community in which its business is established, and, to this end, affords telephonic facilities on as accommodating terms as possible. Should any extraordinary tax be imposed on the poles used for supporting the wires, the company must either abandon its enterprise or cover the imposition by increased charges for telephonic service.

The proposition by some members of our city council to impose a tax of five dollars on each pole is not only unreasonable but against public policy. No repressive tax should be levied on any legitimate enterprise, especially one in the direct line of progress. The public demand cheap postage, because it facilitates social and business intercourse, and for similar reasons they insist on having their telephonic service placed on as economical a basis as possible. Such a tax as that proposed would be extortionate if not unlawful; it would be a discriminating tax, which no municipal legislature has the right to impose upon a lawful undertaking.

We trust that our city council will dispassionately consider this whole matter and deal justly by an enterprise which, though yet in its infancy, has done so much to commend itself to business interests wherever it has been introduced.—*New Orleans News.*

Since December 14th a telephone exchange has been established at Hanover, York Co., Pa., and it promises to be well patronized. This exchange is connected with the York exchange by a trunk line. The message rate for subscribers is ten cents and for non-subscribers is twenty cents. This connection with York will prove a great benefit to the business men of both places and the line will no doubt be largely patronized.

Railroad borough and New Freedom have also been connected with the York exchange. The instrument at Railroad-borough is in the store of Mr. H. T. Day, a young and enterprising merchant. The New Freedom instrument is in the store of Mr. M. W. Bahm, whose business will be greatly enhanced by this connection. Important connections were also made in Lancaster, and other counties throughout the Penna. Tele. Co.'s territory during the past month.

The Mexican Telephone Company being a Boston affair, many of our readers will probably be glad to hear of the excellent showing which it is making for itself, now that it has got rid of the old kite-flying policy which lately controlled its affairs. General Manager Wiley has now got things into thorough shape and good order, and affairs are flourishing as well as could be wished. The company's lines are so systematized in their network spread over the city, that connections are made with new customers at the slightest possible expense. In the central part of the city a service wire has never to be carried over a block to make any desired connection, and in the outlying parts not over two blocks. The orders for new communication average two a day, and the company has all it can do to attend to them. The suburbs are getting well connected by telephone, and an exchange has been established in the pretty little city of Tacubaya, just beyond Chapultepec, starting with a good number of subscribers. A line to Toluca, the capital of the State of Mexico, will shortly be working, and as Toluca is an important business point, and has intimate connection with the capital, and as the telephone will afford much cheaper and more expeditious communication than the telegraph, a good business is assured. The line has been built at low cost to the company, the State Government contributing handsomely toward the work.

The Mexican Telephone Company does the telephone business for the federal district, and is also the parent corporation for all the companies covering the territory throughout the rest of the republic. There are nine of these companies with capitals ranging from $60,000 up to $500,000, and making an aggregate capital of about $2,000,000. Nearly all these companies are doing well. The parent company holds one-fifth of the capital stock of each, and the companies are obliged to purchase all their material and supplies from the former, including a specified number of telephones each year. The aggregate number of telephones purchased has been considerably in excess of the required number thus far.

Consolidation and Presentation.

Since the first of the present month the management of the various telephone companies in this vicinity has been concentrated and consolidated. What has been known as the Worcester division of the Bay State Telephone Company and the Worcester division of the National Bell Telephone Company have been consolidated, and the organization is now called the Worcester division of the New England Telephone and Telegraph Company.

This new division, with Worcester as its center, extends as far east as Natick, on the west to Warren, and south to the Connecticut state line. Mr. W. F. Black is superintendent, with headquarters in Worcester. Mr. Black has for some time had charge of a portion of the territory. The local exchange in this city has for some time been in charge of Mr. Eugene M. Wilson, who has resigned that position to become manager of the Tremont street office at Boston, a much more lucrative and desirable position than the one he filled so satisfactorily here. His successor as local manager is Mr. W. H. Smith, of this city, who has been local manager of the Spencer exchange. All of these changes go into effect next Monday. The gentlemen are all men of experience, and have grown up with the business, having begun at the foot of the ladder and worked up.

Monday evening, just before the employees stopped work, Mr. Wilson was called into the operating-room, to try and unravel a snarl in the wires. The difficulty was soon discovered to be an imaginary one. He was then confronted by Mr. Black, who, in an unusually happy speech, presented Mr. Wilson with one of Rogers' groups, "The Neighboring Pew," from the employes and officers of the local offices. To say that Mr. Wilson was taken by surprise and very much overcome, does not half tell the story. He tried, and as far his feelings would allow, did say, "Thank you." Mr. Wilson will probably reside in Worcester for the present.—*Worcester News.*

Telephone Meeting.

An important meeting of parties interested in the Cumberland and Great Southern Telephone companies was held at Henderson, for the purpose of formally ratifying certain contracts made in Boston last spring with the American Bell Telephone Company. Among those present from Evansville were, Messrs. E. S. Babcock, jr., president of both companies, R. K. Dunkerson, E. P. Huston, and Samuel Bayard; E. M. Barton and M. G. Kellogg, of Chicago; E. T. Baker, of Nashville, Tenn; and Paul J. Marrs, of New Orleans. Messrs. Babcock, Huston, and Marrs left for New Orleans on business connected with their companies.

An Eccentric Suburban.

One of the romantically-grown-rich telephone men, says a Boston correspondent, is Mr. Blake, the inventor of the transmitter in universal use. He lives just out of the city, in the rural town of Weston, where he has a palace and lives like a duke. He bears his great wealth well, and is more of the type of the English country gentleman than is possible for the average new rich man to become. He amuses himself as an amateur blacksmith or machinist, working in metals with his own hands at his forge. He rarely comes to the city, but prefers his quiet life among his tools and his cattle. He serves his guests with huge tankards of beer, using glasses made to contain each three bottles. This is an heroic draught, reminding one of the vast "horns" of the Scandinavian gods and warriors. One of his eccentricities is the wearing of odd shoes, shoes of singular patterns, of which sort of foot-covering he has an immense number. When the inside story of the wealth made in Bell telephones is truly told, as it will be some day, the most romantic story of the last quarter of our century will be public property.

Eighteen professional and amateur scientists assembled in the hall of the Academy of Natural Sciences, at Philadelphia, to inaugurate a movement for the proper reception of the American and British Associations for the Advancement of Science, which will visit that city next September. Professor Leidy presided, and among those on the floor were Professors Lesley and Cope, Philip C. Garrett, President Riche, of the Central High School, and Rev. Dr. McCook.

The next regular meeting of the New York Electrical Society will be held Wednesday evening, January 16th, 1884. Dr. N. S. Keith will deliver a lecture on "Electric Lamps and Regulators." This lecture promises to be one of extraordinary interest. Dr. Keith has devoted much time and care in its preparation, and will exhibit specimens of the lamps used by the various electric light companies.

The meeting of January 2d has been omitted, owing to that date following the holidays so closely.

Kansas City and Northwestern News.

KANSAS CITY, MO., Dec. 20.

The electric light company of this city now has 140 arc lights in use, having put in 35 since November 1. There will not be so much of an increase, however, for several months, as nearly all who were desirous of the light have been supplied. In a recent interview with the superintendent, Mr. E. R. Weeks, he stated, when asked if the light was much more expensive than gas, that it was for most of the consumers. "You see," he continued, "the average business requires from eight to ten gas jets, or about thirty-five candle power. Now all the arc lights in use are of 2,000 candle power, though I believe one company has succeeded in getting a light of 1,400 candle power. Professor Thompson, the electrician of our company, has made two subdivisions of the light, and he will soon be able to give our patrons either a 1,000 or a 500 candle power light, with the prospect in the near future of smaller subdivisions, making the light cheap enough to suit the small consumer. Another obstacle in our way is, that we have had great expense in putting in new engines and generators, but we now have a power that will supply 300 lights as easily as 150, with little more expense. When we get in more lights we can then make a reduction, placing the cost of a light on a par with gas, instead of twenty-five per cent. in advance, as it is now."

In Topeka, Kansas, there are forty Brush lamps in use, and several more have been ordered by the City Council to aid in lighting the city. One of these will be suspended over the Kansas River bridge, which connects North and South Topeka, and another suspended in the middle of the main street in North Topeka, at an altitude of about 40 feet. At the junction of Kansas and Tenth Avenues, in South Topeka, an iron tower 150 feet high has been constructed, and four Brush lamps placed on top, giving an excellent light for all of that part of the city. It was the original intention of the city to have seven (7) of these towers erected, which in all probability would have done away with the use of gas for lighting the streets, but one tower is all that has been constructed as yet.

Abilene, Kansas, is talking of organizing a stock company to light the city with electric light.

In this city, a few nights ago, one of the electric light wires recently strung along Sixth street became crossed with a telephone wire that passed directly above it. At the point of contact a number of brilliant sparks would constantly appear, and occasionally a large, vivid blue light would flash out, attracting the attention of many passers. Among the first to see it was the manager of the telephone exchange who, with the aid of his chief operator, opened the line at each end—at the pole end (where the wire entered the cable box), the kerite wire between the pin and cable box being severed, and at the telephone end the office wire, thus taking off both grounds without causing either end to fall into the muddy street. The danger they apprehended was the burning out of the telephone or the drop in the central office, as this had occurred once before here from the same source.

There are 220 subscribers to the telephone exchange at Topeka, Geo. Bayless, manager. This exchange is giving fine satisfaction, and is constantly increasing. The manager understands his work, and his efforts to improve the service and increase his list of patrons are quite successful. John R. Mulvane, the able vice president of the Missouri and Kansas Co., which owns this territory, resides in Topeka, and has materially aided the growth of the business at that point, as well as at many others.

The manager of the Atchison, Kansas, exchange recently had to run the operating room an entire day single-handed, his two young lady operators having become miffed and suddenly deserted him. He found all the entertainment he cared for in answering the calls that were showered in on him, not only from Atchison but from St. Joseph, Leavenworth, and Kansas City.

By means of a galvanometer and rheostat the long telephone lines extending from here to Topeka, and from here to St. Joseph, were tested this week by Genl. Supt. Smith, of the Missouri & Kansas Telephone Co. The line from here to Topeka, which was constructed last July and August, was found to be in splendid condition, showing less than three ohms variation from what the proper resistance a line 70 miles long, constructed of No. 8 iron wire, should possess. The line to St. Joseph failed to show up so well, though running north and south—a direction that some imagine permits a line to work better than when running east and west. This line is also 70 miles in length, but the test showed that it possessed a resistance equal to 177 miles, and this was attributed to the 20 miles of No. 12 wire which completes the line from Atchison to St. Joseph, and which was built several years ago. This test aided the Missouri & Kansas Co. in deciding to at once reconstruct the 20 miles of No. 12 wire, changing it to No. 8, and this work will commence next week, and then the entire line from Topeka to St. Joseph, *via* Kansas City—a distance of 140 miles—will be of No. 8 wire, put up in the most careful manner. I shall report to you how it works when the change is completed.

An exchange is to be put in at Burlington, Kansas, a city of 4,000 inhabitants. This enterprising little city is in the territory of the United Co.

The Grand Opera House, at Topeka, is to have its chandeliers lighted by electricity.

A colored individual was intently observant of the use made of a telephone by one of the attorneys in the office of Hon. Geo. R. Peck, Genl. Solicitor of the A., T. & S. F. Ry., and after the conversation was ended, turned his attention to the door and seemed on the alert for something. Finally he inquired: "When will they come for de box?" His ideas telephonic seemed to be largely mixed with ideas phonographic.

Col. L. C. Baker, of St. Louis, superintendent of the Western Union Co., was in this city several days last week.

L. M. Fishback, of Los Vegas, N. M., general manager of the telephone company of that Territory, was in Kansas city several days this week. There are four exchanges in the Territory—at Los Vegas, Albuquerque, Socono, and Silver City. Mr. Fishback reports some activity in telephone circles, but just now the gold fever is attracting attention of nearly every one in his domain.

In Kansas City the large telephone poles are all being painted red. The color is a striking one, and gives the poles an Indian chief appearance.

BIPOLAR.

Light vs. Heavy Cables.

The London *Electrical Review* says that from 1851 to 1883 is over 30 years, yet this period has elapsed since the first practical submarine telegraph cable was laid across the English Channel. As is well known, this cable consisted of an insulated conductor surrounded with a padding of yarn and sheathed with an armor of iron wires. This pattern, designed in 1851, has practically been one which has been followed ever since, although, of course, certain improvements suggested by experience have been made. The only one of these improvements which is at all marked has been the serving of the iron sheathing, either separately or collectively, with a coating of yarn covered with a bituminous compound. This serving is intended to preserve the iron wires, and to prevent any broken ends of the sheathing from protruding and catching in the machinery during paying out, and it is a most valuable innovation. More recently, tarred tape has been substituted for the yarn, and the result has been a more finished surface to the cable. Practically, however, as we have stated, the original type of 1851 has not been departed from

Although the idea of a light cable, that is to say, a cable protected with a hemp sheathing only, no iron or other metal being used, has been advocated more than once, it has never, from various causes, resulted in anything being done in the matter. Early in 1874, a company was formed, with a proposed capital of £380,000, for the purpose of laying a light cable to America *via* the Azores. The primary object of this company was to promote cheap telegraphy by the use of light cables, by which ordinary messages could be transmitted at a uniform rate of one shilling for each word. The scheme was strongly advocated at the time by Sir Samuel Canning, Mr. Robert Sabine, Mr. C F. Varley, Mr. Bordeaux and others, but owing to the little public support it received, the project fell through and was never revived.

The advocates of armored cables do not, we believe, hold that light cables cannot be laid, but that they would not be durable, and consequently, that they could not be recovered after the lapse of time. There is, we believe, abundant evidence to prove that hemp, under certain conditions, lasts very much longer than iron. At the recent meeting of the Society of Telegraph Engineers and Electricians, Captain Trott exhibited a sample of hemp which had been under water for *seventy-nine* years and was still perfectly good, and other examples of the durability of hemp under water have often, we believe, been produced.

It must not be overlooked, however, that the question does not turn upon the fact that in certain localities hemp is practically indestructible, but upon the question whether in the particular locality where the light cable is to be placed, its durability can be relied on. The advocates of the light cable system argue that iron rusts and loses its tenacity and then becomes a mere dead weight to be lifted (as it is often lifted) by the strength of the hemp alone, whilst the supporters of the armored system state that hemp decays rapidly, and that if it were not for the iron the cable could not be raised for repairs. The fact that iron does decay in certain localities is, we believe, unquestionable, but it is also certain that hemp decays under particular conditions. Assuming that it were equally possible to preserve the hemp and the iron, there can hardly be a doubt, we think, but that a hemp cable would answer all requirements for *deep sea* purposes at least, for the chafing against rocks, which *must* take place in shallow water, cannot happen at great depths. A hemp-covered cable must, it is clear, have the advantage, as regards prime cost, over one of the iron-sheathed type.

Messrs. Hamilton and Trott, in their excellent paper before the Society of Telegraph Engineers, certainly brought forward very strong arguments in favor of a light cable system for deep sea purposes, and it is to be regretted that circumstances did not admit of the discussion on the subject being adjourned to a future meeting, as much valuable information might have been forthcoming. As it was, the advocates of the iron-sheathed type of cable practically monopolised the discussion, leaving the adherents of the hemp-sheathed system but a few minutes for replying. Although, no doubt, the first speakers had had the advantage of an extended period over which their experience was spread, we think that their arguments, after all, were merely opinions *versus* facts. Captain Trott's statements were the results of actual observation, such as a person continually engaged in cable repairing has alone the advantage of having, and the results of such observation ought to be of far more weight than mere opinions based on a few meagre experiences. The arguments of Captain Trott cannot, we think, be accepted as being conclusive on the subject of the instability of iron-sheathed cables; they rather tend to prove that the laying of the cables which showed breaks due to a distortion or wringing of the armor, was carelessly done, and possibly the grappling was also effected in a manner upon which opinions may differ. Supposing, however, that an iron-sheathed cable is properly laid and can be relied upon for durability, the question of cost must still be largely in favor of hemp alone. The permanence of hemp can, we believe, be thoroughly assured under all conditions met with in the case of deep sea routes, even under circumstances which up to the present have proved unfavorable, and we are convinced that the feasibility of the general idea will have to be tested sooner or later, as competition grows keener.

The B. & O. Telegraph Appointments.

It is stated that Mr. A. B. Chandler, of Cleveland, Ohio, who was tendered the position of manager of the B. & O. telegraph, upon the retirement of Mr. George P. Frick, the present manager, on January 1, has reconsidered his acceptance and declined the position. Mr. Chandler in his present position is very comfortably located, and receives a liberal salary, and after careful thought concluded to decline the proposed change. The appointment will now be made direct from the office, and Mr. Robert Stewart, the present superintendent, is to be promoted to the managership, and Mr. J. B. Stewart, the electrician, will be promoted to the superintendency, retaining his old position as electrician with an increase of salary.

The latter gentleman is one of the best electricians in the country. Until the late strike he was electrician for the entire Western Union Telegraph system; but when the late strikes of telegraph operators occurred he resigned his position with the Western Union Company, and at the solicitation of Superintendent Stewart accepted a similar position with the B. & O. The official announcement of the appointments will be made Monday.

Eastern Telegraph Company.

AUGUSTA, ME., Dec 19, 1883.—The Eastern Telegraph Company, at its annual meeting at the Augusta House this forenoon, elected the following directors for the ensuing year: C. A. Tinker, A. S. Brown, Thos. Roche, Frederic Robie, C. C. Bedlow, J. W. Plaisted and C. D. Livermore. A meeting will be held at some future date for organization.

The American Rapid Telegraph Company will erect six more wires between Philadelphia and Pittsburgh, which will give the company ten between these two points.

The Financial Telegram Company has recently been organized in Boston. It controls all the rights and privileges of the new system of printing telegraph instruments for Boston and other New England cities, and will immediately establish an improved "ticker" service for supplying financial and commercial news, and the quotations of Boston and New York, Philadelphia, Chicago and other exchanges. Its directory is made up of the following named gentlemen: Hon. Bainbridge Wadleigh, Hon. John W. Candler, Irving A. Evans George C. Barrett, R. F. Straine, Hervey E. Wellman, Charles E. Jackson, Luther E. Shinn and John B. Scott.

The annual meeting of the Eastern Telegraph Company was held in Augusta, Me., on Dec. 26, 1883. The following officers were elected :

President—Frederick Robie.

Secretary and Treasurer—C. C. Bedlow.

The officers at Bangor and Portland will be continued.

Transfer of Energy by Electricity.

In discussing Tresca's experiments at the Northern Railway station, the president of the Society of Civil Engineers remarked upon their great value. Even if a quarter of the original energy could be transmitted, there would be many cases in which a force could be transported to a distance, which it would be impossible to produce at the place where it is used. M. Chrétien, thought that the delivery would vary largely under varying conditions. He claimed personally, to have transmitted 60 per cent. in some cases, and even more.—*Chron. Industr.*

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Those desiring to recommend their goods can do so to any extent in our advertising columns, but we will not publish for pay anything of the nature in our reading columns.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

The Proprietors do not hold themselves responsible for opinions expressed by their correspondents.

No notice is taken of anonymous communications.

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The Review and its Patrons.

Having for many months been engaged in recording the progress made by others, we may, perhaps, be pardoned if now, at the beginning of a new year, we pause to say a few words about ourselves—to dwell for a moment upon our labors during the year that is closed, and to briefly outline our intentions for the year that has begun.

The ELECTRICAL REVIEW, in its present form, is but ten months old, yet, if it be compared in influence with many similar journals, long established, in other fields, it may be regarded as having long since attained its majority.

From its very inception it has been a success, and the words of encomium which have been lavished upon it would, were we not too modest to record them, prove conclusively that it has more than fulfilled the promise of its spring.

We set out to publish a journal which should be independent, just and fearless—a journal that should faithfully represent the interests of all persons engaged in reputable electrical enterprises, yet beholden to none. A substantial proof that the plan has succeeded may be found by a glance at our advertising pages and our subscription books. The edition now being printed amounts to very nearly *eight thousand copies weekly.*

It finds its way through the regular channels to all parts of the civilized globe, and we refer to those whose advertisements have appeared in the columns of the REVIEW to prove that they are read and responded to from the remotest corners of the earth.

The publishers did not start out with an idea to reap a rich harvest with a small expenditure and little labor. On the contrary, we have spared neither expense nor labor. We have placed before our readers at the earliest possible moment the latest and most important intelligence of electrical progress, to a great extent accompanied by carefully-prepared drawings, and can truthfully say we have never considered the cost. Conducted on this plan, the REVIEW has kept so far ahead of all competitors that, were it not for occasional clouds of dust to be seen rising far behind in the distant roadway, we should not be aware of the fact that there were any rivals in the field on this side of the Atlantic.

The publishing department of the REVIEW has been conducted on strict business principles, and a glance at the advertising pages will show that we may justly be proud of it. Every advertisement in the columns of the REVIEW is *bona fide.* It was inserted at the request of the advertiser, and is paid for in accordance with a regular scale of rates, from which, with like conditions, we never depart. Look the advertising columns carefully through, and you will find no notices of quack medicines; you will find no puffs of children's toys, nor of old ladies' cough drops. We don't advertise chest protectors, nor rat poisons, nor cures for rheumatism, nor visiting cards and the like. If you want a cure for any of the ills to which human flesh is heir, don't look in the ELECTRICAL REVIEW, because it is not devoted to pills, potions and pungencies. But if you want the address of a reputable house where you can obtain electrical goods of any description, you will find it without trouble in these pages. We use the expression reputable house advisedly, because the publisher of the REVIEW will not accept the advertisements of bogus concerns under any circumstances whatever. As our readers well know, it is not long since that we thrust out of these columns a well-paying advertisement because we found that it was calculated to deceive the purchaser, and from time to time the publishers have been called upon to refuse admittance to these columns to the advertisements of houses which are not looked upon by the trade as reputable; and we say for the future what we have said in the past that such people need expect nothing from the REVIEW. We want neither their advertisements nor their acquaintance.

In the interest of its patrons the REVIEW has commented upon the various projects and controversies which have, from time to time, appeared upon the horizon of the electrical field. In doing this the REVIEW has been stayed neither by the threats of the designing nor by offers of patronage from the unscrupulous.

In doing this the REVIEW has not been prompted by prejudice nor by favoritism, but solely by an honest desire for fair play and fair dealing.

Uttering naught in malice, but with good will and kindness toward all, the course of the REVIEW has been commended by reputable electricians far and near, and its ability to properly represent the electrical field of the United States has found gratifying acknowledgment even from those who would like to have been its enemies.

In the future the strong stand taken by the REVIEW for fair dealing will be maintained. Steps are being taken to still further increase its scope and to widen and extend its influence. No pains nor expense will be spared to keep it abreast of the times—an able exponent of American ingenuity and electrical progress.

With this promise the REVIEW wishes its patrons a Happy New Year.

Consistency, thou Art a Jewel!

A journal known for its hostility to electric lighting, printed last week, with startling headlines, an article on "Dangerous Electric Lights." At the first glance, the casual reader would conclude that several persons were killed or injured, as the dangerous lights were in a crowded theater (Miner's). Careful reading, however, showed that what threatened the lives of the audience, was the falling to the floor of a piece of the glass globe from the electric lights in the dome caused by a fine copper wire suddenly fusing. No one was hurt.

In the same number of the same journal appeared two dispatches, recording deaths from illuminating gas, the one from Scranton, Pa., the other from Cleveland, Ohio. From the first it was learned that two men had been suffocated by illuminating gas in a hospital; from the other, that a woman and her child had been suffocated by illuminating gas, and her husband and two remaining children asphyxiated.

The breaking of the incandescent electric lamp in Miner's Theater, a globe four inches long, was dwelt upon as a great calamity; while the records of four deaths in one night, and the asphyxiation of three other persons, were recorded in mild terms without comment, as though matters of little consequence.

"Consistency, thou art a jewel!"

Mental Effects of Prayer.

Since the advent of the American mind-reader, Bishop, our English scientific contemporaries have been greatly agitated upon the subject, and devoted whole pages in attempts to get at the philosophy of the thing.

Aware of the interest they take in this and kindred subjects, we desire, from purely friendly motives, to call their attention to a very singular case of the effects of prayer, in hopes that, though they have not yet unraveled the mind-reading conundrum, they may possibly be able to explain this one, and thus do a valuable service to science, while, at the same time, taking a great burden from off our minds.

That, at which we would respectfully ask our European contemporaries to direct their intellectual telescopes, is a case of mental quickening, produced by prolonged prayer on the part of Mrs. Harrison Ramon, of Hickley, Medina County, Ohio. Her husband had amassed great wealth in ready money, which he would neither intrust to banks nor keep in the house He promised his wife that he would one day tell her where to look for it; but he died suddenly, without fulfilling his promise.

Stimulated by faith, and the example of ancient prophets and modern believers, the widow prayed for twenty-four hours without ceasing. All search before this exercise had proved fruitless; but when she got up from her knees, the faith that can remove mountains impelled her to remove a bee-hive. Beneath it lay part of the treasure, which she had swept her house diligently, but in vain, to find.

Her sympathetic faculty led her to lift the other bee-hives, and on the *ex pede Herculem* principle she piled together $15,000. This was an earnest to her that her prayers had been heard.

The afflatus of directed impulse did not rest here, for the good woman knew by her late lamented husband's books that he had left no less than $335,000 stored away.

She was again impelled, and remembering, perhaps, that Providence "moves in a mysterious way, His wonders to perform," she also moved around mysteriously in search of further golden revelations. Accidents have a share even in special providences, as a wasp was the selected instrument for furnishing the Sabbath breaker while he was playing cards, according to Sydney Smith, by stinging him on the nose, thereby causing the cerebral inflammation which killed him, so the casual dropping of a bunch of keys by one of her family through the floor of the barn, directed the prayerful widow to have a plank removed to find them. A half-gallon fruit jar, filled with $20 gold pieces, was revealed, thanks to the careless hand that had dropped the casual keys.

Soon other jars, numerous as those in which the forty thieves, of nursery story, concealed themselves, and a grain bag, literally filled with golden grain, met her enraptured vision, until the eye of faith had the satisfaction of counting $213,000 in gold and currency.

A balance of $122,000 is yet to be prayed for, but half a day's prayer will probably suffice for this undiscovered remainder. Perish the Lucretian philosophy which can only

"Sing how casual bricks in airy climb
Encountered casual cowhair, casual lime."

This widow's prayer has cast so large a fortune into her treasury that we may expect all widows of secretive husbands to be much upon their knees.

The Hygiene of Artificial Light.

Of all the vast benefits accruing to humanity from the advances made in sanitary science, and particularly from the constantly increasing recognition of its right of eminent domain, there is perhaps none greater, certainly none of more importance than the education the people have thus received in matters of personal and family hygiene—more particularly looking to individual sanitary surroundings.

We now find sanitary subjects generally, and more or less intelligently, discussed, and an apparent desire for further knowledge as to methods is so frequently shown as to be truly gratifying. That this interest is real, and not so superficial as it might seem, the experience of every medical man abundantly proves. Although "malaria" and "biliousness" still hold a wide-spread popular sway, all headaches, vertigos, and other slight and temporary or intractable ailments are not now so readily attributed to their influence as formerly. The necessity of an abundant supply of fresh, and a proper disposal of vitiated air has become more universally appreciated than ever before, and outside sources of atmospheric contamination are being more carefully looked after. How many cases of obstinate neuralgia, indigestion and more serious diseases result from daily confinement during business hours, in the gas-lighted and usually ill-ventilated interior offices so common in our crowded commercial quarters, cannot perhaps be readily computed. Now-a-days, a patient seeking medical advice, does not fail to mention these hygienic defects, if they exist, or to admit them when questioned. This knowledge of the necessity of an unpolluted atmosphere is still more marked in the domestic management, and the promptness with which a leaking gas pipe is attended to is only surpassed by the alacrity with which the plumber is sent for on the slightest suspicion of an escape of sewer-gas.

That the highest degree of good health is

not compatible with defective sanitary conditions is now a statement which requires no argument; and that good air, good light and cheerful surroundings are necessary to the proper welfare of mankind is of course equally positive.

The improvements in methods of artificial lighting, which began nearly a century ago in the discovery that carburetted hydrogen gas could be utilized as an illuminant, have been of almost incalculable benefit, both as to convenience of use and quality of light supplied; but they have also served, like most other mere improvements upon faulty systems, to more distinctly emphasize the defects of the thing improved. For, after all, the gas flame is the result of the same chemical action as that of the knot of "fat pine," the tallow-dip, or the oil lamp, viz: the rapid oxidation of a carbonaceous body. In each case the source of light is the flame, and its construction is always identical, *i. e.*, the central portion of unburnt gases; the next envelope of partially burned and very dense gaseous particles heated to incandescence; and finally, the outer cone of completely burned gas. In considering, then, light as resulting directly from this process of combustion, we may safely confine our attention to the gas flame as representing this system of illumination in its highest degree of perfection.

The first question to demand attention must be the dangers attending the only apparently available method of a general and proper supply—the dangers of leakage either from street mains or from distributing pipes. That either coal gas or "water gas" is extremely poisonous when inhaled in large quantities needs only reference to the large number of deaths annually reported—resulting either from carelessness, accident or design—to demonstrate. But as these causes can scarcely be considered in discussing the actual hygiene of gas supply, except to prove the reality of the dangers always present, and to show the character of the pathological changes discovered after death, bare mention of them will suffice. An appreciation of the deleterious effects of prolonged breathing of an atmosphere containing small or almost imperceptible quantities of gas requires some knowledge of its composition. Good coal gas, fairly purified, consists chiefly (Wood and Parkes) of hydrogen (40–50 per cent.); marsh gas—light carburetted hydrogen—(30–40 per cent.); carbonic oxide (4½–7½ per cent.); olefiant gas—ethylene—and other hydro-carbons (4–8 per cent.), and a slight admixture of the sulphur compounds, carbonic acid and air. The illuminating quality of this composition lies mainly in the olefiant gas; the other constituents burning without light, and serving thus as diluents and heat conductors. In the manufacture of the so-called "water gas," the first product is a mixture of hydrogen and carbonic acid—carbonic dioxide. The latter shortly loses half its oxygen, and becomes the carbonic oxide. These gases, burning without light, are also diluents to the extent of about 90 per cent., and require, to be useful as an illuminant, the addition of about 10 per cent. of petroleum—or naphtha gas. This mixture contains from 30 to 40 per cent. of carbonic oxide—a gas exceedingly dangerous to life; the more so as it soon becomes odorless from the ready absorption of the accompanying gases by carpets, woods, earth, etc.

How dangerous a leakage of this gas may prove can readily be estimated when it is known that less than 4 per cent. in the atmosphere cannot be breathed for any length of time without producing in most persons the characteristic symptoms of this form of poisoning—a sensation of oppression and tightness in the head, giddiness, palpitation of the heart, loss of appetite, and general prostration of strength. Pushed to an extreme degree, the patient soon becomes unconscious, and if not relieved dies from the narcotic effect of the poison. After death an examination reveals the various causes of the symptoms before death. First is found more or less generally marked venous congestion, but particularly noticeable in the brain and nervous centers, the heart and lungs. This condition is to a great extent due to paralysis of the vaso-motor system of nerves, which is found in all cases of narcotic poisoning. In the case of carbonic acid poisoning, the blood is found to be dark and fluid from imperfect oxidation and the complete reduction of the hæmoglobin. While, with the same evidences of involvement of the nerve centers, the changes produced in the blood itself by the carbonic oxide poisoning are widely different. The carbonic oxide displaces the oxygen in the blood, and paralyzes (Bernard) the oxygen carrying-power of the blood corpuscles, and forms a new and very stable compound with the hæmoglobin, which cannot be readily broken up This new chemical compound gives the blood and congested parts a bright cherry-red color, and frequently gives to the features the ruddy hue so often mistaken for a sign of remaining vitality.

Having thus considered the dangerous effect produced by inhaling the gas itself, let us now take up the question of its combustion, keeping in mind its chemical constitution as given above. The oxidation of all carbonaceous bodies is attended with the absorption of oxygen from the surrounding air, and the giving off of a new oxide, the carbonic acid gas. This process is constantly going on in the human body, and the earliest intelligent efforts at ventilation were directed to giving a constantly fresh supply of oxygen and the proper disposal of the carbonic acid and the air vitiated by exhalations from the body. R. A. Smith (Air and Rain), found that one person sitting for one hour and forty minutes in a closed chamber containing 170 cubic feet of air, gave off by exhalation, one per cent. in carbonic acid, of the entire atmosphere of the room, and one gas burner in operation gives off an amount several times greater than does one man. When perfect combustion occurs there can be no production of the carbonic oxide in the process There are other sources, however, of contamination in the oxidation of other than the carbonaceous constituents of gas. Sulphur and its gaseous compounds are almost unavoidable impurities. As much as 60 grains of sulphur have been discovered by Parkes in 100 cubic feet of coal gas, while the English Parliamentary limit is 20 grains. The burning of 30 grains of sulphur to every 100 cubic feet of gas gives rise to about 90 grains of sulphuric acid, which set free in a room by any process, cannot fail to have a highly deleterious influence, not only upon individuals exposed to it, but also upon textile fabrics and leather. This was noticed especially several years ago in the large public libraries of London; the covers of books being destroyed by the sulphuric acid of the burning gas. The amount of this acid was so great that it could be tasted by applying the exposed portions of the books to the tongue (E. S. Wood). Especial efforts have been made by sanitarians and inventors to provide for the escape or destruction of these noxious products of combustion, by means of different systems of ventilating pipes and other appliances placed directly upon the burners; but the apparatus for this purpose must necessarily be so cumbrous, that so far they have been found impracticable for small consumers, and have had only limited employment where large quantities of gas are used, as in hospitals, &c. With this knowledge of the sources of contamination of the air attendant upon the use of gas as a general illuminant, together with the difficulties of constant purification and supply of fresh oxygen, the inevitable conclusion must be that light obtained from combustion is incompatible with the laws or requirements of good general hygiene as given above. As to special hygiene, or rather the proper care and protection of special organs and functions, much may be said. As above stated, the first effect of the products of oxidation is upon the nerve-centers, giving rise to giddiness, headache, and general *malaise;* in other words, their narcotic effect. Before chemical changes take place in the blood itself—except those owing to the displacement of oxygen—the veins dilate, as we have seen from paralysis the vaso-motor centers, and the result is congestion—more especially during earlier stages—of the brain. This condition, if prolonged, might easily give rise to a more or less marked hyperæmia and, if the subject is debilitated, to hypostatic congestion and a sort of mechanical dropsy when the blood becomes more fluid and disorganized. The lungs, too, deprived of their accustomed and necessary stimulus, diminish in tone and strength and are more prone to disease, and here also the same results of partial paralysis of vaso-motor nerve force exhibit themselves with the same attendant evils. What must be the result of prolonged or frequently repeated venous congestions and hyperæmias? As to the lungs, this question is answered in every common school text-book on physiology. What upon an organ so sensitive to fluctuations in circulation as is the brain? Other organs, as the liver, spleen and kidneys, readily show the effects of similar conditions from various causes, in their frequent hypertrophic and atrophic disease states. Has it ever been claimed or proved that the brain is a less sensitive organ than these? Certainly the nerve-centers are the first to be overcome in acute carbonic acid and carbonic oxide poisoning, but to what extent they are affected by prolonged or frequently repeated milder exposure, is a question demanding further investigation. The alarming increase in comparatively recent years, of all forms of mental and nervous diseases, cannot, of course, be properly attributed to any one special cause, where so many might be and have been named, but surely there can be no denial of the statement that any one of the numerous unhygienic conditions of our modern high-pressure civilization must act as an important factor. Other faulty hygienic and sanitary elements of a rapidly increasing population are being eliminated as rapidly as improvements are discovered, and for years scientists and inventors, recognizing the defects of the entire system of artificial lighting by means of an exposed flame, have been endeavoring to find a practicable substitute. Success has at last been attained and, with certain improvements as to practical distribution and supply, bids fair to become perfect at no distant day.

The requirements demanded of a perfect artificial illuminant, are brilliancy, absolute steadiness under use, a minimum amount of heat evolved, and one other to be mentioned later under visual hygiene. The incandescent electric light supplies these demands, and is free from all the objectionable features above noted in the flame-light, when used for interior illumination; the carbon filament being in a vacuum can give off no fumes or deleterious gases, or produce any rearrangement of chemical elements. The amount of heat is scarcely perceptible. According to figures published by *Nature*, a 100 candle-power incandescent lamp gives off from 290 to 536 heat-units, while an Argand gas-burner, the next coolest light, gives off 4,860, and a flat-wick petroleum lamp 7,200 heat units.

For purposes of exterior lighting, the electric arc furnishes a highly satisfactory and vastly improved substitute for all previous methods. In considering light itself, obtained by artificial means, as a hygienic factor, it will be necessary to take up the question of its effect upon the eyes, which question could not properly be discussed while considering the effects of the noxious gases upon other special organs. In all efforts to obtain results artificially, that shall meet natural demands, it is well to remember the well-worn aphorism that the nearest approach to nature constitutes the highest degree of art. The naturalness of the light furnished by the electrical current can be, and has been already, much improved by adhering more closely to natural methods. The complaints most frequently heard of the electric light, have been on account of the glare and the intense shadows produced by a powerful lamp. Both objections may be overcome by breaking the directness of the rays by means of proper globes, shades and screens; the phenomena of natural refraction may thus be artificially secured and the proper diffusion that is so necessary to the health and comfort of the eye.

Given then, the incandescent electric light, brilliant, steady and diffused, we have an illuminant conforming almost perfectly to the laws of ocular hygiene, giving the same sense of restful comfort to the eye in use; permitting the choice of colors given by perfect day light, and giving a spectrum whose quantitative distribution of the necessary light-tints makes an exceedingly close imitation of nature.

The close reader or writer does not choose gas light for steady or prolonged work, knowing by experience the consequences he must suffer from such a strain. The light does not meet the requirements of the eye for visual purposes. Its bad color and unsteadiness are so completely opposed to what the eye is accustomed to and demands from natural sources of light, that all its functions become overtaxed, and absolute rest becomes necessary in order to avoid permanent injury. The statement has been made by good authority that the intricacies of the German alphabetical characters are to blame for the very frequent hereditary visual difficulties of that myopic nation; that these congenital ocular defects have been produced through generations of such over-taxation of the eye. Certain it is, that a hypermetropic eye does become myopic from prolonged and excessive use in poor light, through the effect produced upon the delicate accommodation and ciliary muscles; and also that both conditions are hereditary. With these facts and considerations in view, it would not require a great imaginative power to suppose that a perfect eye could become deformed to a certain extent as well as weakened or otherwise injured by long-continued abuse. At any rate, whether the congenital ocular defects that are so common with us, really do depend upon the bad hygiene of the poor quality of artificial light supplied to our ancestors, will require at least a generation or more of improved illumination to determine.

It is not difficult to foretell something of the immediate possibilities of the electric light, but the boldest can scarcely imagine the extent of the revolution which will be brought about by its means in all departments of life. Aside from any consideration of the improvements in the arts, the various applications of the refinements of civilization or even improved scientific theories, this subject opens up a grand field for the speculative moral philosopher. If it is true, as this optimist will assure you, that the real standard of morality has been elevated in the same degree that the improvements in civilization have ministered most to the alleviation of humanity at large, he will find that all the efforts at a satisfactory solution of that great problem—the differentiation of energy—will not furnish him a more potent or all-pervading influence in promoting good moral hygiene than this, the electric light.

Howard Oil Mills Lit Up with One Hundred Maxim Incandescent Electric Lights.

Houston has once more scored a success in the fact that she has again outstripped her rival cities in the establishment of the first incandescent plant ever put into successful and practical operation in the State of Texas.

Hearing that the Howard Oil Mills Company had put in 100 of these novel and beautiful lights, a reporter, in company with Mr. E. Raphael, President of the Houston Electric Light and Power Company, and a party of friends, drove out to the mills to witness the operation of turning on the lights.

Arrived at the mills, they were introduced to Mr. A. W. Westerfield, who was sent out from New York to put up the machine, wires and lamps, and who conducted the party through the mills and pointed out the arrangements of the lamps, wires, cut-offs, etc.

The entire establishment was lit up with the incandescent lights by this time and every department was at work as though it were daylight instead of night. The first place visited was the engine-room, where the

ELECTRIC DYNAMO

was situated, firmly bolted to the floor. This machine, which furnishes electricity for the 100 lights, runs at a speed of 1,000 revolutions a minute, and is belted to the main shaft and driven by the large Porter-Allen engine, which supplies the power for the entire machinery of the oil mills. From the dynamo the main wires are led into the different departments, branching off to the various lamps, and after traversing the entire area of the buildings and sheds the circuit returns by other wires back again into the machine. The

INCANDESCENT LAMPS

are suspended from the ceiling and walls, where they are needed, and the little globe of glass within which the tiny film of carbon is inclosed, glows with a soft, white incandescent heat, shedding a mild, effulgent light of about fifteen candle power. The light is soft to the eyes, and perfectly steady, and, notwithstanding the fact that the press-room vibrates with the heavy clanking of the machinery, yet the lights are not affected thereby. The reporter was told that the life of these little lamps, apparently so fragile and delicate, was of remarkable strength and durability, and have an average lifetime of 2,000 hours. When the lamp is exhausted a new one can be inserted in its place by a simple spring in a few seconds. One of the most practical arrangements to these little lamps is a clock, like those on an ordinary gas jet, whereby the light is turned on or off instantly. They require no matches to light them, and this fact, insuring absolute safety from fire, makes them peculiarly valuable in mil's and industrial factories.

Being inclosed in an air-tight glass globe no substance can take fire from these lights; neither do sudden gusts of wind or currents of air affect them in the least. The reporter watched some of these lights, which were located outdoors, and although it was a misty night, with a strong easterly wind blowing, the little incandescent lights glowed as calmly as though they were situated in a parlor. The lights at the mills are distributed as follows:

Superintendent's office	5 lights
Seed shed	20 lights
Engine-room and meal mill	15 lights
Oil press-room	15 lights
Refinery	28 lights
Boiler-house	5 lights
Lint-room	12 lights
Total	100 lights

The reporter retraced his steps and walked back into the room to take a good look at the dynamo, once more, and learned that the machine and lamps were contracted for by Mr. T. R. Chancey, General Manager of the Howard Oil Mills, and furnished by the Houston Electric Light Company. The light is known as the Maxim Incandescent Light, manufactured by the United States Electric Lighting Company of New York, whose patents are controlled in Southern Texas by our local company here. The work of putting up the machine, running the wires, and erecting the lamps was begun by Mr. Westerfield, the electrician, on November 21. This is remarkably quick time, for so large a contract, and reflects credit on the energy and perseverance of Mr. Westerfield.

In regard to the dynamo the reporter learned that it was automatic in its working, and that although a hundred lights were burning they could all be extinguished but one, and the current of electricity would automatically decrease its strength, so as to furnish only current enough to run the one light.

Not only that, but the power required to run the dynamo is also decreased in proportion as the lights are diminished. This is considered a very valuable feature in the machine.

As the reporter took his leave and glanced back at the buildings, through the windows of which the numerous lights danced and twinkled, he could not help but think what a grand discovery science had made in the perfection of the incandescent light.—*Texas News.*

Book Reviews.

A TEXT-BOOK OF INORGANIC CHEMISTRY. By Professor Victor von Richter, University of Breslau. Authorized Translation of third German Edition. Edgar F. Smith, A.M., Ph. D. Philadelphia. P. Blakiston, Son & Co., Publishers.

Suidas, in his lexicon (A. D. 1100) defines chemistry as the making of gold and silver; Libarius, in 1595, as the art of making chemical preparations, and of extracting the pure essences in a separate form from mixtures; Lemery, in 1675, as the art which treats of separating the different substances which occur in mixtures; Bergman, in the latter part of the eighteenth century, as the science which investigates the components of bodies in regard to their nature, their properties, and the manner in which they are combined; Macquer, at about the same time, as the science which makes known to us the nature and properties of all bodies by composing and decomposing them. To the last two definitions, which express quite fully the ideas of chemists of the present day, may be added that of Berzelius: "Nature is composed of certain elementary bodies or elements. The knowledge of these bodies, of their mutual combinations, of the forces by which these combinations are brought about, and of the laws in accordance with which these forces act, constitutes chemistry."

In the volume before us, Professor von Richter, apparently with this idea of Berzelius before him, keeps before the student continually, not only the character of bodies and their combinations, but also the laws which govern them.

In presenting his subject, the author has been careful to bring out prominently the relations existing between fact and theory. These, as is well known, are in most textbooks upon inorganic chemistry, considered apart, as if they have but little in common The results attained by the latter method are generally unsatisfactory. With much care and dexterity he describes experiments with a view of drawing conclusions from them and proving the intimate connection between their results and the theories based upon them. This is, we think, much to be preferred to their separate study, especially when they are treated in widely-removed sections or chapters of the same book.

The Periodic System of the Elements, as announced by Mendelejeff and Lothar Meyer, is somewhat different in the manner of development and presentation from that appearing in former editions of the same work. This, we are informed, has been done in order to give more prominence to and make more general the interesting relations disclosed by it. This system, if carefully examined, will be found to have much to commend it. New relations and facts are constantly appearing. The thermo-chemical phenomena, here introduced, is a new feature presented in the individual groups of the elements, and in separate chapters, together with the chemical affinity, relations, and the law of periodicity. "Hereby," we are told, 'more importance is attributed to the principle of the greatest heat development than at present appears to belong to it, because it was desired, from didactic considerations, by the explanation of the few anomalies, to afford the student the incentive and opportunity of deductively obtaining the majority of facts from the thermal numbers, on the basis of a simple principle."

One of the many chapters in Prof. von Richter's book, which will be found especially attractive to electricians, is that upon the principle of the Conservation of Energy. Chemical energy causes, he says, underlie and influence all material phenomena; the final cause of phenomena we term force, accepting for the various sorts of phenomena a variety of forces. Some of these are attraction and repulsion, light, heat, electricity, cohesion, chemical affinity, and others. These names, however, only represent kinds of phenomena, without explaining their true nature. The positive knowledge we possess of the nature of some forces is that they consist of modes of motion. Thus the phenomena of light are explained by the vibrations of ethereal particles which penetrate all substances; and those of heat are dependent upon the motions of the smallest particles of matter. Accurate physical investigations have established that the different forces or causes of motion can never be destroyed but merely changed from one kind to another. The movements or vibrations of one variety pass into those of another. For example, says Prof. von Richter, a discharged bullet is heated by coming in contact with any obstruction in its course; the visible motion of the entire mass in this instance is transformed into the invisible motions of the smallest particles, and appears as heat. The heat motions can, on the other hand, be again changed into mechanical force (molecular motion) or into light, magnetism, or electricity.

In all these transformations, of the different forces into each other, the author says, there are observed a perfect equivalence of their quantity; if a mechanical force can produce a certain degree of heat, so can, *vice versa*, the latter perform the same mechanical work (the mechanical equivalent of heat, light, electricity). Upon this equivalence of force rests the principle of the conservation of energy, according to which the various forces or motions of matter can neither be annihilated nor produced anew. This principle, which, in the estimation of the author, forms one of the most important corner stones of natural science, was first defined by the speculative observations of Dr. J. R. Mayer, of Heilbroun, in 1842, and since then has been repeatedly confirmed experimentally.

"The most recent advance in physics has led to the negation of the objective existence of all the abstract physical forces. Not considering the phenomena of electricity and those of chemical affinity—the reduction of which two forms of motion is clearly foreseen, and not to be doubted—the only remaining, as yet, enigmatical force is that of attraction or gravity. To affirm the existence of gravity is nothing more than to give expression to the fact that bodies in space tend to approach each other. The supposition that the active cause of gravity existed within the bodies themselves was long ago discarded by Newton as '*absurdum*'; it is merely a mathematical fiction. The action of a body in a place where it does not exist without the aid of a medium is inconceivable. The transference of the gravitation into material bodies further contradicts the principle of conservation of energy, as gravity is neither transferred nor exhausted—be it through the approach of bodies, whereby the force always increases; be it by planet movement, in which the centrifugal component is constantly overcome. Therefore, the active cause of gravity is not to be sought after in bodies themselves, but without them, and indeed in a substantial medium—ether, without the acceptance of which natural investigation cannot proceed.

If we desire to make a preliminary presentation upon these relations, the following would be the simplest and most probable: Space is filled by the smallest possible material particles, but as they are all alike, they do not possess gravity and are found in constant transferable motion—*ether substance.* By the congress of the smallest ether particles to mass aggregates arise the chemical elementary atoms, which constitute material bodies—substance or matter. If now, in addition to this one mass-aggregate a second appear in space, an effort to approach each other, produced by the action (collision) of the disturbed ether surrounding them, will appear; they possess gravity. By these suppositions the obscure ideas upon potential energy and energy of place are removed. A clearer and more thoroughly distinct presentation and conformation of these representations and especially upon the nature of forces, may be found in the works of A. Secchi.

In the chemical union of bodies, says Prof. von Richter, heat is almost invariably disengaged; and, as it is a variety of motion, and as motion of one kind can only be derived from another we must conclude that bodies acting chemically, especially the elements, do possess a peculiar kind of motion which in chemical union, is partially converted into heat motion (also into light and electricity). This special motion of matter is designated chemical energy or chemical tension; and in the chemical decomposition of a compound body into its constituents, continues Prof. Richter, heat is absorbed, disappears as such, and is transformed into chemical energy. Thus, for instance, in the union of one kilogram of hydrogen with eight kilograms of oxygen, a quantity of heat is liberated which can perform a mechanical work equal to $34,462 \times 423.5 = 14,629,000$ kilos; in the decomposition, on the other hand, of nine kilos of water into hydrogen and oxygen, the same force or quantity of heat is necessary; therefore, in the liberated hydrogen and oxygen, the same quantity of force or motion must be continued in the form of chemical energy.

The Electrical Review.

In this "electrical age" every man who wants to be apace with the times must keep himself posted with the electrical work of the day. While he cannot be expected to be a thorough electrician himself, yet it is his privilege to be fully posted as to the wonderful progress that is being made in the practical application of electricity. The way to do this is to regularly read a journal entirely devoted to this subject. The paper that has won for itself distinction among the electricians of America and Europe is the ELECTRICAL REVIEW, published weekly at New York city, for $3.00 per annum. It is a paper that should interest every intelligent man.—*The Telephone, York, Pa.*

Illumination of Boilers.

The lighting up of the interior of steam boilers was long ago suggested. It has lately been carried into practical operation by the Patent Steam Boiler Company, London. They arrange lights within the boiler in such a way that the cascades, currents and miniature whirlpools of the water may be clearly observed. It is believed that useful information will be derived from the observations touching the cause of priming, the best modes of separating steam from the water, etc.

The Standard Electrical Company of Cincinnati, we notice, are doing a booming business on their bells; especially since they introduced the new gear-wheel. They are running full capacity, night and day, since the telephone convention, and are way behind their orders.

Kempe's Electrical Testing is just now out of print, but will be ready in the course of sixty days.

Telephone Stock Quotations.

American Bell Telephone Company	196
Central New York Telephone and Telegraph Company	103
Empire State Telephone and Telegraph Company	205
Hudson River Telephone and Telegraph Company	105
New York and New Jersey Telephone Company	85
Mexican Telephone Company	3¾
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Southern Bell Telephone and Telegraph Company	130
Tropical Telephone Company	2½
Central Union Telephone Company	100
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Missouri and Kansas Telephone Co.	92
United Telephone Company (Kansas and Missouri)	89
Bell Telephone Company, of Missouri	165
Wisconsin Telephone Company	125
Cumberland Telephone Company	100
Great Southern Telephone Company	100
Michigan Telephone Company	105
Chicago Telephone Company	286
Erie Telephone Company	59
Union Telephone Company	100
Southern New England Telephone Company	178
New England Telephone Company	75

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DECEMBER 26, 1883.

290,689 Electro-magnetic car-brake; Richard Kampfe, Brooklyn, N. Y.

290,709 Break-key attachment for magneto-electric generators; James S. Ross, Nashville, Tenn., assignor of one-half to William Nichols, Boston, Mass.

290,730 Switching apparatus for telephone lines; Jacques Victor Michel Bartelous, Brussels, Belgium.

290,732 Electric circuit cut-off; A. Livingston Bogart, Jamaica, N. Y.

290,752 Telegraph pole; Benjamin A. Davis, Chesterfield county, Va.

290,753 Electrical conductor; Patrick B. Delany, New York, N. Y.

290,769 Telegraph and telephone wire; Gorham Gray, Boston, Mass.

290,835 Carbon; Walter C. Beckwith, Allegheny, Pa.

290,844 Electric conductor for fire-hose; Charles M. Bowman, Lebanon, Pa.

290,845 Electric switchboard; Henry W. Breckenridge, Providence, R. I., assignor by mesne assignments to the Rhode Island Telephone and Electric Company, same place.

290,853 Electrical conductor; Henry F. Campbell, Concord, N. H.

290,854 Electrical cable; Henry F. Campbell, Concord, N. H.

290,873 System of electrical generation and distribution: Moses G. Farmer, Newport, R. I.

290,881 Submarine electric conductor; J. Burrows Hyde, New York, N. Y.

290,894 Electric clock-setting mechanism; James Frederick Kettell, Worcester, Mass.

290,898 Telephonic repeating circuit; Thomas D. Lockwood, Malden, Mass.

290,922 Insulator for electrical conductors; Frank L. Pope, Elmora, N. J.

290,941 Electrode for electric batteries; Eli T. Starr, Philadelphia, Pa., assignor of one-half to H. M Lewis and James W. White, both of same place, and William J. Peyton, Washington, D. C.

290,942 Electrode for electric batteries; Eli T. Starr, Philadelphia, Pa., assignor of one-half to William J. Peyton, Washington, D. C., and H. M. Lewis and James W. White, Philadelphia, Pa.

290,943 Secondary battery electrodes; Eli T. Starr, Philadelphia, Pa., assignor of one half to William J. Peyton, Washington, D. C., and H. M. Lewis and James W. White, Philadelphia, Pa.

290,971 Electrical conductor; Henry F. Campbell, Concord, N. H.

290,978 Telephone; Daniel Drawbaugh, Eberly's Mills, Pa.

290,979 Telephone; Daniel Drawbaugh, Eberly's Mill's, Pa.

290,980 Telephone transmitter; Daniel Drawbaugh, Eberly's Mills, Pa.

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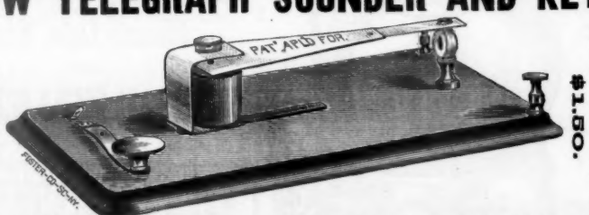

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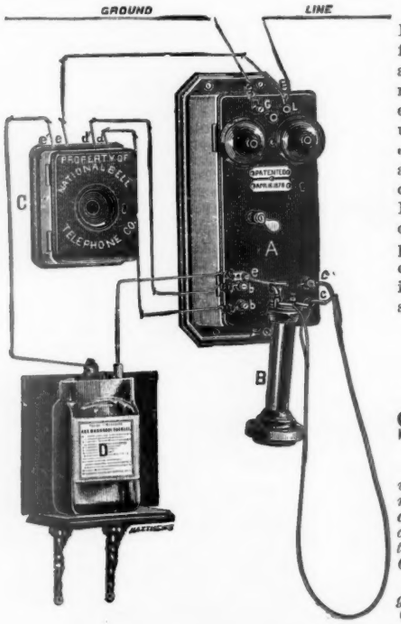

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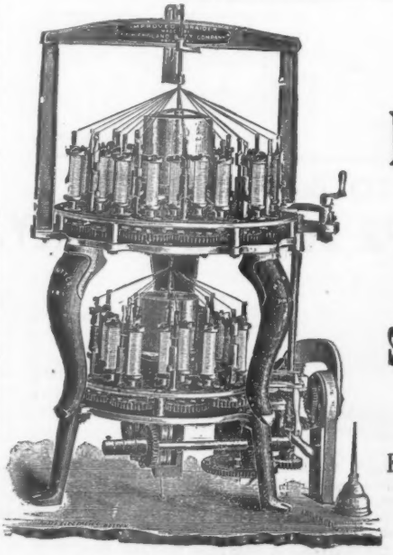

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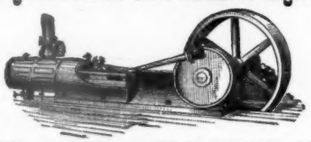

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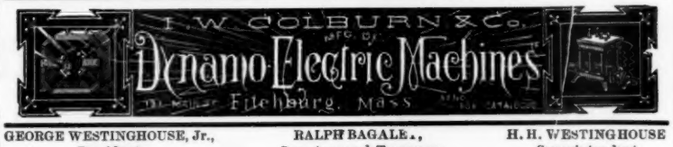

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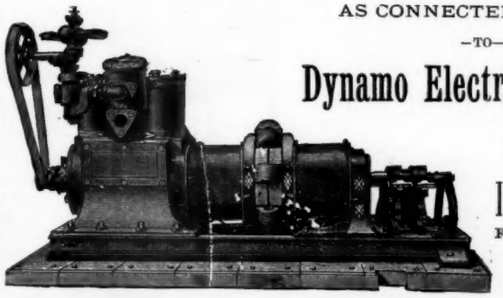

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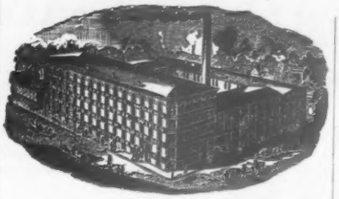

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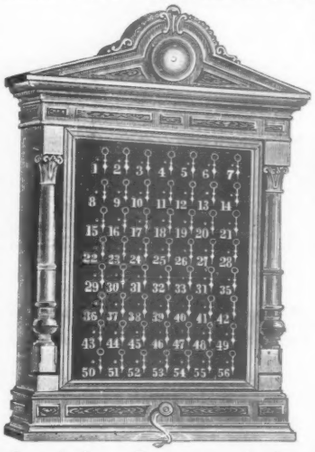

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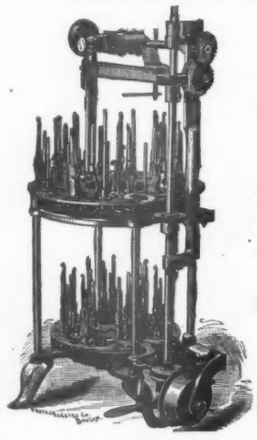

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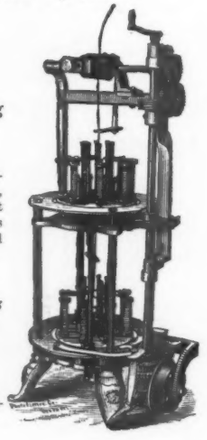

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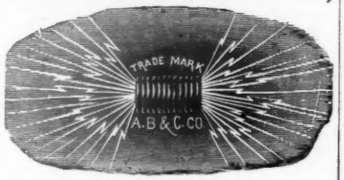

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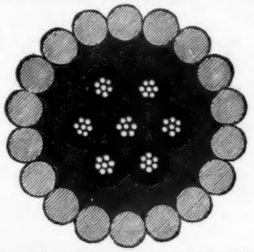

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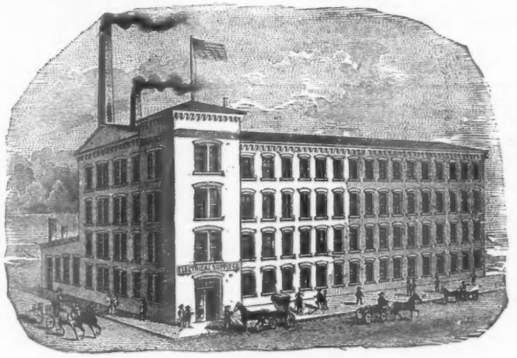

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